INSIDE: WANKEL T. REX GOES TO WASHINGTON

# Montana Outdoors

MONTANA FISH, WILDLIFE & PARKS | $3.50

NOVEMBER–DECEMBER 2019

## REPRODUCTION RIDDLE
## HARLEQUIN DUCKS

IN THIS ISSUE:

THE PUBLIC TRUST
WHAT SPLITS THE STATE
HOW BIRDS WEATHER WINTER
STAYING AHEAD OF A BAT KILLER

Montana Outdoors

FIRST PLACE MAGAZINE:
2005, 2006, 2008, 2011, 2017, 2018
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VOLUME 50, NUMBER 6

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**PREDATOR OR SCAVENGER?** Posed feeding on a Triceratops, this remarkable T. rex fossil now in the Smithsonian Institution's Natural History Museum was discovered in 1988 on a Fort Peck Reservoir island by Montanan Kathy Wankel. Read about her discovery, and the new exhibit in Washington, D.C., where the famous fossil now resides, on page 10. Photo by Kevin Lamarque/Reuters.

**FRONT COVER** Harlequin ducks are North America's only stream-dwelling waterfowl. See how biologists are learning about these remarkable birds on page 34. Photo by David Stimac.



# Montana Outdoors

NOVEMBER–DECEMBER 2019

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### Article inspires safety actions

Thanks to *Montana Outdoors* magazine, my friends and I are alive today to enjoy more Montana adventures. This past July, four of us were kayaking the Yellowstone River just south of Emigrant when we apparently took a wrong channel and approached what looked like a small pedestrian bridge, but which was likely some kind of irrigation structure. From a distance, it looked like the water flowed through smoothly, so we decided to paddle between the two abutments on the far right side of the structure. I was in the lead and began to have a bad feeling about the situation, mainly because I had just read your article, "Deceptively Dangerous," in the July-August 2019 issue. As I got closer, I noticed that I could not see all the water moving under the structure but was still unsure what it was. At the last second, I saw the drop-off and realized it must be a "drowning machine" low-head dam, as described in the article. My friends behind me said they have never seen anyone make such a sharp right turn in a kayak, and they followed. We managed to get to the rocky right-hand bank and portage around the dam. If I had not read the article, all four of us most likely would have gone over it because it looked like "fun."

Ann Seifert
*Helena*

*Scott Opitz, FWP fisheries biologist in Livingston, replies: These floaters encountered what's known as the Park Branch Diversion, which is indeed a low-head dam that can act as a "drowning machine." The main entrance channel is signed, alerting floaters to the dam and potential dangers, but a new, smaller side channel formed in the spring of 2018, and it is not yet signed. As Ms. Seifert and her friends so wisely did, river floaters should always be cautious and pull over to the bank to inspect unknown or unfamiliar obstacles before attempting to float over or through them. If the obstacles look at all dangerous—which is challenging with low-head dams because the deadly hydraulics are hidden beneath the water surface—always portage around them.*

My wife Kate and I floated the Jefferson River in late August, from the Cardwell Bridge (FWP) fishing access site to Sappington Bridge. While pulling out at Sappington, we met six young women about to put into the river. They had various forms of inner tubes and no life jackets. Inspired by your excellent article on diversion dam dangers, we showed them the location on our river map of a diversion dam just downstream, told them how we spot it as we approach the structure, and encouraged them to pull out and walk around it. We trust they made it with no problems and had their own wonderful time on the Jeff. Thank you, *Montana Outdoors*, for that article.

Scott Bischke
*Bozeman*

> **"Inspired by your article, we showed them the location of the diversion dam just downstream."**

### Additional accessible buttes

We were surprised that the reply to a reader's question "Are any buttes accessible?" (September-October) did not mention Montana's majestic Chalk Buttes. They lie within the Sioux District of the Custer National Forest, approximately 15 miles southwest of Ekalaka in Carter County.

Access is available on the Trenk Pass Road. Once entering the NFS property, the gravel road becomes a two track that requires four-wheel drive. However, hikers may park their city vehicle there and explore miles of these public land buttes for a week or a weekend.

Doug and Mary Stange
*Crazy Woman Bison Ranch*
*Ekalaka*

### Ducks hunters support moose research

Your article "Solving Montana's Moose Mysteries"(September-October) is well written and contains great information on the decline of the state's Shiras moose population. The article mentions "other partners" who are assisting FWP with the ecology studies. One major conservation partner that was omitted is Montana Ducks Unlimited (MTDU). Since 2014 MTDU has raised over $200,000 for Montana Shiras moose research through the annual auction of the statewide moose license awarded by the Fish and Wildlife Commission each year. These funds have been used by FWP biologists for radio telemetry collars and other equipment to further their understanding of the moose population dynamics. The 2020 statewide Shiras moose license will be offered at auction at the Helena Ducks Unlimited Banquet on Friday, March 6, 2020. Ducks need water, and so do Shiras moose.

Steve Christian
Montana DU State Council
*Colstrip*

### Trap-release tips: nonsense

I am strongly opposed to all snares or traps and wonder why your agency continues to promote this cruel, heinous method of killing our wildlife. As to the nonsense about freeing our pets from snares and traps ("Quick Release," September-October), and that we should carry special pliers to cut these cables: A dog will not just stand there and wait patiently for you to free it, as your pictures show. No person on public lands should ever have to worry about encountering these killing devices. Our public lands belong to all of us.

Joan McKeown
*Joliet*

### Speak your mind

*We welcome all your comments, questions, and letters to the editor. We edit letters to meet our needs for accuracy, style, and length. Write to us at* Montana Outdoors, *P.O. Box 200701, Helena, MT 59620-0701. Or e-mail us at: tdickson@mt.gov.*

# 3-for-1 White Meat Delight

By Tom Dickson | Preparation times vary | Cooking times vary

My wife and I become especially budget conscious this time of year. As the holidays approach, we pinch pennies to pay for gifts, extra travel, and special meals. In the spirit of holiday-season economizing, I'm providing a multi-recipe special: three speedy, delicious recipes I've discovered recently that work great for the breast meat of blue grouse or pheasant, or, for those who don't hunt upland birds, free-range chicken. (Free-range birds cost a bit more than caged chickens, but I think they taste better.)

The Korean Barbecue recipe derives from one by Food Network star Bobby Flay. The idea of using pickle juice to brine and flavor meat is from southernliving.com, while the rub comes straight from *Cook's Illustrated*. Marsala and Mushrooms is based on a recipe featured on the *New York Times* cooking site.

All three recipes are devised for 1½ to 2 pounds of white meat.

As regular readers of this column may expect, these recipes require buying some out-of-the-ordinary ingredients. But that's what it takes to create out-of-the-ordinary dishes with extraordinary flavors. All the ingredients can be found in major Montana urban grocers, rural Albertsons stores, or Walmart Supercenters.

Some readers may question smothering the unique taste of game birds with exotic spices and flavorings. To some extent, I agree. If you have just one or two grouse or pheasants, by all means savor their wild essence by sautéing the breasts in butter and serving plain with salt and pepper. But if you have several birds in the freezer, or are using chicken, it's fun to occasionally enliven the meat with new ingredients.

*Happy Holidays!*

*—Tom Dickson is editor of* Montana Outdoors.

*Note: If using chicken, double all cooking times.*

### KOREAN BARBECUE BREASTS

Heat grill. Whisk 1 c. soy, 3 T. rice vinegar, 2 T. honey, 1½ t. Korean fermented chili paste, 2 T. grated fresh ginger (or 1 t. powdered), and 6 chopped garlic cloves in a bowl. Divide the mixture in half. Add half to a large baking dish, then add the breasts, turning to coat. Cover and let meat marinate in the refrigerator 2–8 hours. To the other half, add 1 thinly sliced green onion, 2 t. toasted sesame oil, ½ t. black pepper, and 1½ t. toasted sesame seeds. Reserve as a dipping sauce for the finished meat.

Remove breasts from marinade and put on the grill, skin side down. Grill 5 minutes until skin is golden brown and crisp. Relocate meat to an indirect heat zone, lower the cover, and grill 3 more minutes until cooked through. Remove meat from the grill to a cutting board and carve. Arrange grilled breasts on a serving platter and serve wrapped in tortillas, if desired, with dipping sauce on the side.

### PICKLE JUICE–BRINED BREASTS WITH BARBECUE SPICE RUB

Add 1–1½ c. leftover sweet or dill pickle juice to a 1-gallon plastic freezer bag. Add breasts. Refrigerate 2-4 hours. Light grill and mix 3 T. packed brown sugar, 1 T. paprika, 1 T. chili powder, 2 t. garlic powder, ½ t. salt, ½ t. pepper, amd ½ t. cayenne in a small bowl. Whisk in 2 T. olive oil. Remove breasts from brine, pat dry with paper towels, and apply the rub on both sides. Grill breasts. Serve with pickles and rice.

### MARSALA AND MUSHROOMS BREASTS

Heat 1 T. oil in a medium-sized skillet. Dredge breasts in seasoned flour and brown in oil, 2 minutes per side. Remove from skillet to a serving platter. Heat 1 T. oil in the skillet, add 8 oz. thinly sliced mushrooms and 1 chopped shallot or ½ small onion and cook 5 minutes. Add 4 T. Marsala and cook until reduced by half. Stir in 3 T. chicken stock and heat for 1 minute. Remove from heat and swirl in 1 T. butter until melted. Pour sauce over the meat and garnish with chopped parsley.

SHUTTERSTOCK

# Why we have all this

Not long ago I visited Smith River State Park for a three-day float. The park is an oasis of clear water, tall limestone bluffs, lush shorelines, and chattering kingfishers that seemed to lead us around every bend. The surrounding national forest and ranches are home to elk, deer, black bears, songbirds, and nesting bald eagles, and the river is famous for its brown, rainbow, and cutthroat trout fishing.

It struck me then, as it has so many times, how fortunate we are to have places like the Smith in Montana. Fortunate, but not lucky. Montana started out with abundant mountains, prairies, and rivers, inhabited by unimaginable numbers of native wildlife and fish. But it's thanks to the wisdom and foresight of federal, state, and tribal governments decades ago that so many of those resources are still with us—and will be far into the future.

The framework of laws and regulations safeguarding Montana's great outdoors includes the Migratory Bird Treaty Act, the Endangered Species Act, and the Clean Water Act; Montana legislation like the Stream Access Law and Stream Protection Act; landmark documents like the Montana Constitution; and guiding principles such as the North American Model of Wildlife Conservation. The underpinning of these and other efforts to secure and steward wildlife and other natural resources is what's known as the "public trust."

The public trust concept derives from the long-held belief by many societies, including the United States, that certain natural resources are so important to everyone that they should be off limits to individual ownership, or privatization. And that it's the government's responsibility to steward these public resources for the fair and equitable enjoyment of current and future generations.

The word "trust" in public trust doesn't mean "faith" or "certainty." It refers instead to an arrangement in which one person or group acts as the steward of funds or property (or in this case, natural resources) and manages them to benefit another person or group.

It's like if your mother gave you $10,000 with the understanding that you'd hold, protect, and safely invest the money and use it to provide for her needs. For this to work legally, she would set up what's known as a "trust," with you as the "trustee" and herself as the "beneficiary" of the trust. Your responsibility would be to manage the assets of the trust—the $10,000—and use the proceeds to pay for her present and future needs.

As the trustee, you would have to invest prudently and responsibly. For instance, you couldn't use the money to bankroll a friend's dodgy business venture. You couldn't spend it on yourself, either.

It works the same way for Montana's rivers, water, fish, wildlife, cultural resources, and state parks. Those public resources are held "in trust" by the state, acting as the trustee, for the people of Montana, the beneficiaries.

Why is the state involved? First, because the public needs some way to collectively decide the most equitable and sustainable way to manage and allocate trust resources for current and future generations. Legislators, the governor, Fish and Wildlife Commission members, Parks and Recreation Board members, and department directors are elected or appointed to make decisions on behalf of the the trust beneficiaries. If the trustees don't uphold their obligations to protect the long-term health of the trust, the beneficiaries can hold them accountable in the courts or at the ballot box.

The other reason for state involvement is that public trust resources require stewardship and management by trained professionals. That's the role of biologists, game wardens, park managers, technology specialists, and others who work for FWP.

FWP's responsibility to steward the public trust, with other state and federal agencies, explains almost everything this department does. We provide hunting, fishing, and other outdoor recreation opportunities so that people today can use and enjoy their fair portion of the public trust. But we also balance that use against the need to conserve wildlife, fish, and state parks for future Montanans and visitors.

**We provide hunting, fishing, and other outdoor recreation opportunities so that people today can use and enjoy their fair portion of the public trust. But we also balance that use against the need to conserve wildlife, fish, and state parks for future Montanans and visitors.**

FWP employees are not the only ones with trust responsibilities. Teachers, firefighters, police officers, community health specialists, and all other public employees are responsible for protecting and stewarding a wide range of public needs, including education, safety, and health—each of them a trust of its own.

In future issues of *Montana Outdoors*, I'll discuss how societal changes increasingly challenge the public trust that FWP is responsible for conserving. I'll also describe how Montanans have reconciled differences with sensible solutions that preserve both the public trust and other deeply cherished values, such as property rights. And I'll explain how we must continue that tradition of respectful, collaborative problem-solving to meet future challenges to the public trust and all it stands for.

—**Martha Williams**, Director, Montana Fish, Wildlife & Parks

SHUTTERSTOCK

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JEREMIE HOLLMAN

# DAM IMPROVER

**BRIAN MAROTZ**
FWP Hydropower Mitigation Coordinator, Kalispell

MY JOB IS TO MAKE SURE several hydropower dams and big diversion dams in Montana operate in ways that benefit fish and wildlife. On the west side of the state, I work on Hungry Horse (seen behind me in this photo), Libby, and SKQ (Séliš Ksanka Qĺispé, previously Kerr) Dams using funding largely provided by the Bonneville Power Administration. On the east side, I'm currently focused on Fort Peck Dam on the Missouri and Intake Diversion Dam on the Yellowstone.

Dams dramatically change fish and wildlife populations and entire ecosystems. Upstream, they flood spawning and rearing streams along with vast amounts of wildlife habitat. Downstream, they disrupt a rivers' natural flows and water temperatures.

Fish, riparian vegetation, and aquatic insects have adapted to a single annual high water event from snowmelt runoff. Dams, built in part to manage floods, release vasts amounts of water in winter to draw reservoirs down to contain those spring freshets. Now high water downstream occurs many months earlier than usual, reversing the natural cycle.

After several years of studying hydropower, power marketing, and flood histories, I designed a way for dams to release enough high water in spring to restore the ecological benefits of spring runoff without flooding towns and farms or reducing electricity revenues. Known as the Montana Operation, this method has been adopted at Hungry Horse and Libby Dams and could be used to benefit other reservoirs throughout the Pacific Northwest.

I also designed a way to restore natural water temperatures downstream of Hungry Horse Dam during our short summer growing season. Since completion in 1953, Hungry Horse had released frigid water from the reservoir bottom that rarely rose above 41 degrees F—much too cold for trout to flourish. I worked with the Bureau of Reclamation to design a temperature control system—and Congress appropriated funds to retrofit the dam—for dam operators to select water from the various layers of the reservoir to release just the right river temperatures downstream that trout need. In 1995, before the retrofit, surveyors recorded 48 westslope cutthroat trout in one stretch below the dam. In 2007, after a decade of dam operators using "selective water withdrawal," surveys showed 1,149 cutthroat in that same stretch. Two years ago, surveyors told me there were too many fish to even count. And the improved temperatures below Hungry Horse Dam continue downstream for 50 miles to Flathead Lake.

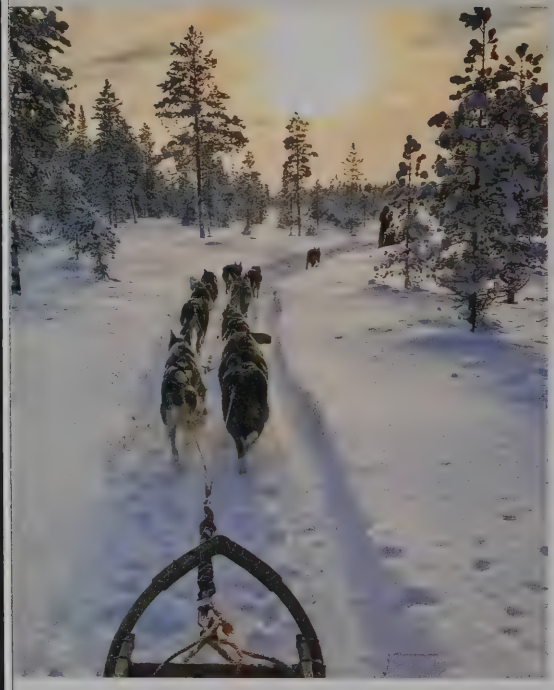
Early most mornings before work, **Elizabeth Moore**, director of special events and sales for the Lewis and Clark Foundation in Great Falls, walks through Giant Springs State Park with her camera. "It's a magical place, and it also has one of the most diverse bird populations in the region," says Moore, whose office is at the Lewis and Clark Interpretive Center just a half mile upstream from the park. One cold morning last winter, Moore stood on the bridge that crosses the spring for more than an hour, waiting for the sun to rise. "I go there so much I knew right where it would come up," she says. Though her toes eventually went numb, she says the photograph was worth the discomfort. "I call this shot 'Narnia,' because to me this is just what I imagine the winter wonderland looked like in the first book of the Narnia Chronicles, *The Lion, the Witch and the Wardrobe*."

**22** Amount, in millions of dollars, of the maintenance and infrastructure backlog at Montana's state parks

## Mush!

Riding in a dog sled is a rush. It's just you, the musher, and 10 dogs running their hearts out along a packed snow trail. "The dogs are going nuts with excitement before we take off, but once they start running it's just so quiet and peaceful we call it the 'magic carpet ride,'" says Mat Stimpson, who owns and operates Absaroka Dogsled Treks in Paradise Valley with his wife, Hannah Vogel.

Find dog sledding operators and dog sled race locations at visitmt.com by searching for "dog sledding."



Once common across North America, red-winged blackbirds are among the species experiencing major population declines.

WILDLIFE LOSS

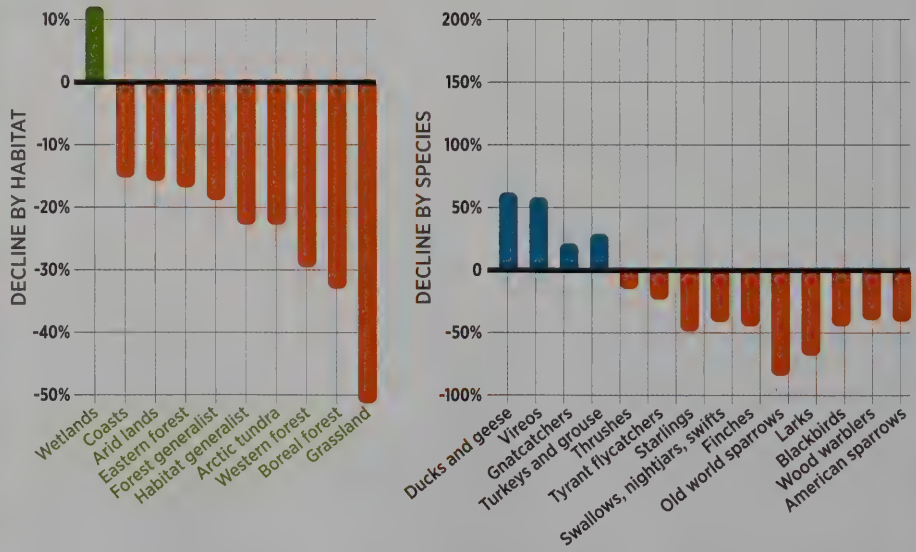
# "Really wrong" bird losses

If you're not seeing or hearing as many meadowlarks, sparrows, or blackbirds as you did a few decades ago, it's not your imagination. A major new study reports that birds living or breeding in the United States and Canada have declined an average 29 percent since 1970.

The study, published in the September issue of *Science*, reports that human actions such as plowing grasslands and draining wetlands have contributed to declines in most North American bird populations. The result is a total loss of 2.9 billion individual birds during the past half century. Most of the lost birds are common species, including house sparrows and red-winged blackbirds. "If we can't keep those populations healthy, then something's really wrong," Ken Rosenberg, a conservation scientist at Cornell Lab of Ornithology, who was the study's main author, told the *Wall Street Journal*.

Hardest hit were grassland birds, with a 53 percent decline, including the loss of 139 million individual western and eastern meadowlarks. Forest bird species showed declines of more than 1 billion birds since 1970. Red-winged blackbird numbers dropped by 92 million. Other major declines occurred among chimney swifts, grasshopper sparrows, horned larks, and green herons.

One bright spot was an increase in waterfowl, due largely to conservation efforts by duck hunters to protect key wetlands and grasslands used for nesting and rearing. ■




K. ROSENBERG ET AL., *SCIENCE*, ADAPTED BY LUKE DURAN/*MONTANA OUTDOORS*

CLOCKWISE FROM TOP LEFT: CARTOON BY MIKE MORAN; DONALD M. JONES; SCOTT STURKOL; EAGLE CLAW; SHUTTERSTOCK

RECOMMENDED READING

# Curl up with a good one

Here at *Montana Outdoors*, we love books. These, all by Montana authors, are worth reading this holiday season, giving as gifts, or both. For fans of:

### *Outfitter stories*

**Under the Biggest Sky of All:** 75 Years on Montana's Rocky Mountain Front

*by Ron Mills of Augusta*

### *Horses*

**Give Me Mountains for My Horses:** Journeys of a Backcountry Horseman

*by Tom Reed of Pony*

### *U.S. Forest Service history*

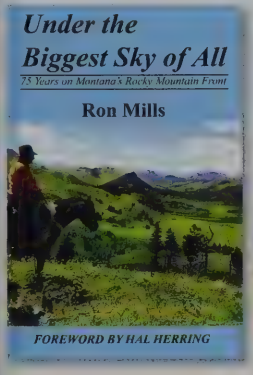
**Forty Years a Forester**

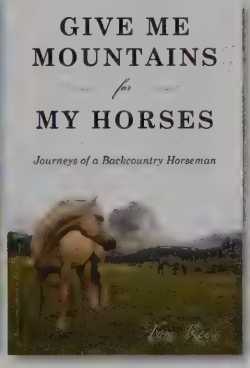
*by the late Elers Koch of Seeley Lake*

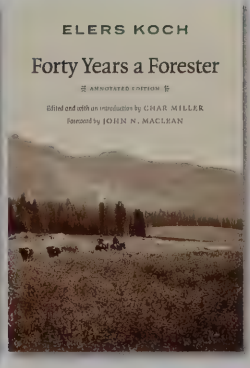
### *Forest rangers*

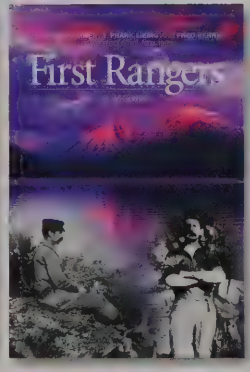
**First Rangers:** The Life and Times of Frank Liebig and Fred Herrig, Glacier Country, 1902-1910

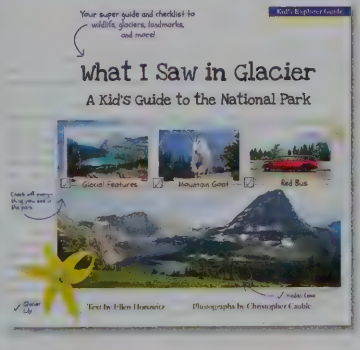
*by C.W. Guthrie of Missoula*

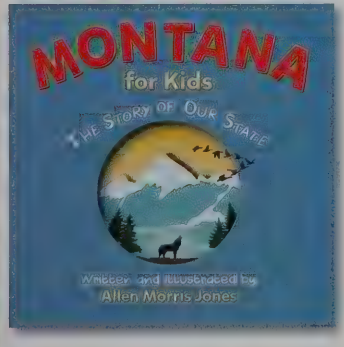





### *National parks for kids*

**What I Saw in Glacier: A Kid's Guide to the National Park**

by Ellen Horowitz of Whitefish

*Winner of the High Plains Book Award, Children's Book category*

### *Trophy bighorn sheep*

**Giant Rams of Montana**

by John "Timmer" Reeves of Butte

### *Fun history guides for kids*

**Montana for Kids: The Story of Our State**

by Allen Morris Jones of Bozeman

*Winner of the Western Writers of America's Storyteller Spur Award for Illustrated Children's Book.*

## Claw your way out of an ice hole

Breaking through weak or thin ice on a lake, pond, or reservoir can be terrifying or even fatal. Often the wet ice around the hole is too slippery to provide any grip for pulling yourself out of the frigid water.

The best way to survive falling through ice is to carry a pair of ice claws. Ice claws, or picks, are metal spikes set in plastic or wood dowels attached by a cord for wearing around your neck. The inexpensive safety tools are sold in major sporting good stores and online.

**Tips for using ice claws (from the ice safety experts at the Minnesota Department of Natural Resources):**

- If you break through the ice, try to remain calm.
- Turn toward the direction you came from, where the ice is likely stronger.
- Dig the metal points into the ice and, while kicking your feet, pull yourself onto the surface by sliding forward.
- Roll several yards away from the area of weak ice.
- To prevent deadly hypothermia, get to a heated shelter or vehicle, change into warm, dry clothing, and consume warm, non-alcoholic drinks.
- Call 911 and seek medical attention if you feel disoriented or have uncontrollable shivering.
- If a buddy breaks through, tell them to "Stay calm" and that "We'll get you out of there in a second." Toss them your ice claws and explain how to use the safety tools.

# THE WANKEL T. REX MAKES "THE SHOW"

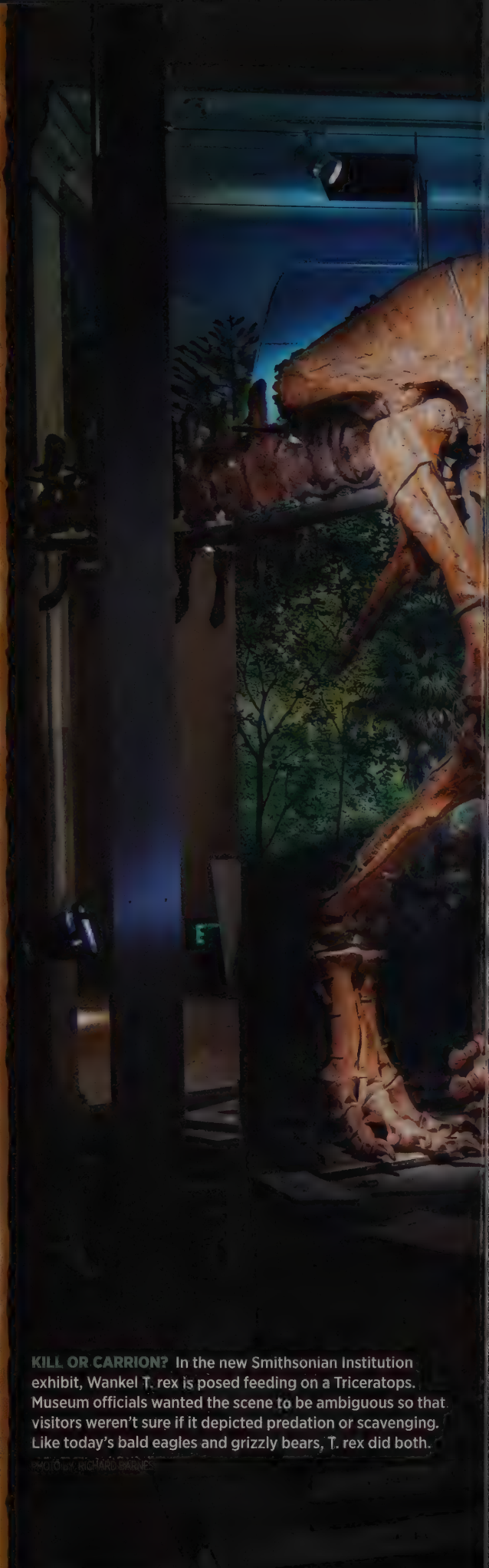
## How Montana's most famous prehistoric predator ended up starring in a premier Smithsonian Institution exhibit

**By Steve Hendrix**

A long time ago, in a part of this state that is now arid desert but was then humid swampland, an egg hatched. It was the beginning of an epoch-spanning life story that continues still, beginning a new chapter this past summer in the nation's capital.

The egg is long gone. The skin and muscle of the animal that climbed out of it—38 feet long and six tons once it grew—are history (or prehistory). But when it died on the banks of a creek after 18 good years at the top of the food chain, its bones settled into the enveloping mud. The current teased away the flesh, pushed its skull a few feet downstream, shifted a shoulder blade.

But more sediment filtered down, locking the skeleton in a geologic hug that would go unbroken—through 66 million winters, the collision of continents, the rise of mammals—until just before 9 a.m. on Labor Day in 1988, when Kathy Wankel caught a glimpse of that shoulder blade. ▶▶



**KILL OR CARRION?** In the new Smithsonian Institution exhibit, Wankel T. rex is posed feeding on a Triceratops. Museum officials wanted the scene to be ambiguous so that visitors weren't sure if it depicted predation or scavenging. Like today's bald eagles and grizzly bears, T. rex did both.

PHOTO BY RICHARD BARNES

"It was right over there, just a bit of it sticking from the earth that caught my eye," Wankel said 31 years later on her first return to the site that changed her family story and recently became part of her country's story, too. The "Wankel T. rex," one of the largest and most complete skeletons of the meat-eating dinosaur ever found, debuted June 8 as the star attraction of the newly refurbished, $110 million fossil hall at the Smithsonian National Museum of Natural History.

For all its ferocious reptile rep, scientists still debate whether the living Tyrannosaurus rex was a dominant predator or just a toothy scavenger, feasting hyena-like on the carrion of the late Cretaceous. But today, their fossilized remains reign unchallenged in paleo-pop culture, the iconic king of all the dinos portrayed in movies, played with in kids' bedrooms and displayed in museums. The Smithsonian—which had a replica T. rex towering over visitors in its old dinosaur exhibit—has been desperate for a real one for decades. The museum is thrilled to get the prime specimen Kathy Wankel spotted that September morning.

"It's the centerpiece," said Kirk Johnson, director of the museum and a noted paleontologist (who thinks T. rex was a predator). "It's the anchor of the whole exhibit, and it's going to bring a lot of joy and excitement."

This bony being is an ambassador from an Earth without humans. But it is also an individual with a personal history: a tale—and a tail—that has touched ranchers, researchers, and dinosaur lovers for years.

The history of the skeleton known to Montanans as the "Wankel T. rex," to the Smithsonian as the "Nation's T. rex," and to scientists as "MOR555," has three parts. The first we know little about—researchers can't even tell whether that hatchling was a girl or a boy. The second part was 24 billion days of stony silence. But the third . . . that's where it got interesting.

*Previously titled "The Nation's T. rex: How a Montana family's hike led to an incredible discovery," this article was originally published in the* Washington Post *on June 1.* ©2019. *Reprinted with permission.*

### KATHY LIKES TO ROCK HOUND

Kathy Hove was born in Mississippi near the border with Louisiana, where, coincidentally, the wide, warm, and wet forests are a pretty good facsimile of what eastern Montana looked like before the Rocky

**DISCOVERY SITE** Recently Kathy and Tom Wankel returned to the site where they discovered a T. rex skeleton on a small island in Fort Peck Reservoir in 1988. Accompanying them is Pat Leiggi, Museum of the Rockies director of paleontology, who led the excavation in 1990.

JONATHAN NEWTON/THE *WASHINGTON POST*

Mountains rose up to block all that moisture flowing from the west. But she grew up in Montana, where she married lanky Tom Wankel, her high school sweetie. They started a spread in the treeless badlands where ranchers scratch a living and paleontologists scrape for fossils.

They'd been at it a dozen years when they took the three kids camping up at Fort Peck Reservoir, a dammed section of the Missouri River close to the Saskatchewan border.

"I like to fish; Kathy likes to rock hound," said Tom, 69, on a recent spring morning in the living room of the ranch house where they still live, surrounded by 250 head of Black Angus and about 40 cats. It's 18 miles to the nearest paved road.

Geologists know the area as the Hell Creek Formation, a vast swath of land eroded just enough to uncover the layers of time and earth where dinosaurs once walked. Kathy knew to look for bones and stones alike.

It was a time of drought; Yellowstone National Park 400 miles to the south was on fire and the reservoir level was down dramatically, allowing her to scour widely along the shore. That's where she was when a small protrusion from the slope—like the corner of an envelope—stopped her roving eye. She bent closer.

"The light was just perfect," said Kathy, who was 35 that morning and is 66 now. "I could even see the webby pattern of the bone marrow."

She called Tom, who scrambled up the slope. They pondered a lot and poked a bit, but the hard-baked clay was too much for his pocketknife, and the kids had school, so the waiting bones would wait some more.

It was about a month before they could return. They came in the fall, found the spot, and chipped a set of long bones from the rock. For the first time since its final breath, the T. rex—or part of it—was on the move, bouncing down a ranch road in an orange cooler that does beer duty for the Wankels to this day.

Kathy washed the fossilized bones in the sink on the back porch, laid them on the basement ping-pong table amid her collected agates and quartz, and wondered: Who do you call when you find a dinosaur?

**NAMESAKE** Above: Kathy Wankel, 66, was 35 when she discovered what was later officially designated Wankel T. rex, reflecting the common practice of naming scientific finds for the individuals who found them. Below: Jack Horner, former curator of paleontology at the Museum of the Rockies, provides scale for T. rex fossils at the excavation site on Fort Peck Reservoir in 1990.

TOP TO BOTTOM: JONATHAN NEWTON/*THE WASHINGTON POST*; MUSEUM OF THE ROCKIES AT MONTANA STATE UNIVERSITY

## YOU'D BETTER COME INSIDE

The Museum of the Rockies started out as a Quonset hut packed with Old West memorabilia on the campus of Montana State University in Bozeman. But it was already gaining status as a hotbed of paleontology by the late 1980s, when a phone call from a rancher out in Hell Creek territory led to its biggest boost yet.

It was Thanksgiving break when the Wankels loaded the bones on a cardboard meat tray and drove them 350 miles west to Bozeman. In an autumn snow, they backed their station wagon up to the museum loading dock. Pat Leiggi, then the chief fossil preparator, walked out without much expectation.

"We get a lot of calls from people saying they'd 'found something,'" Leiggi said, remembering the moment at the same loading dock three decades later. "We end up

**BRONZE BRAWN** Using a mold created directly from the Wankel T. rex bones, this bronze reproduction outside the Museum of the Rockies was created in 2001. Weighing five tons, it was the first life-size bronze T. rex ever made, and today is one the museum's star attractions.

looking at a lot of rocks."

He went out, peered into the back window for a long moment, then looked up at the Wankels. "You'd better come inside."

Jack Horner, the museum's founding curator of paleontology (and reportedly the model for the dinosaur expert in *Jurassic Park*), had never seen the lower arm bone of T. rex before. None had ever been found. When Leiggi and the Wankels filed into his lab with their cardboard trays, that changed.

"It was obvious what it was," he recalled in an interview.

"They were all in there with their Marlboros just a-puffin'," Kathy said. "They'd puff and look down and puff and look down. And then Jack said, 'Could you show us where you found these?' "

## BEAUTIFULLY ARTICULATED

The T. rex was buried in layers of earth and bureaucracy alike. It was nestled on the shore of a federal reservoir at the edge of a national wildlife refuge, and figuring out who controlled the land, getting permissions, and Montana's short summer field season meant it was more than a year before Leiggi and his crew set up camp and started to jackhammer in earnest.

"Right over there is where we had the kitchen," Leiggi said on a recent May morning, pointing to a spot at the base of a slope. He had joined the Wankel family on their first trip back to the spot since that month of excavation.

It was a big dig. The Army Corps of Engineers bulldozed a road, and the science series *Nova* set up a time-lapse camera to track progress. Only about eight T. rex skeletons had been uncovered at that time, Horner recalled. They knew they had a big one.

Leiggi and colleagues had partly uncovered the animal's spine in a test dig the season before, protecting the find under a "winter jacket" of plaster and hiding it under sagebrush. Now, with brute force and fine finger-work in turn, they removed more than 60 tons of caprock until the outlines of the beast revealed itself, still in its agonal pose, its neck thrown back in the rigor of death.

Once they had measured and photographed every bone in its prehistoric posture, they encased whole sections in plaster and lifted them, surrounding rock and all, with Army Corps bulldozers. The pelvic bloc alone weighed more than 7,000 pounds. They would expose them completely over

KELLY GORMAN/MONTANA STATE UNIVERSITY

the next several years at a specially constructed display lab at the museum.

"It was beautifully articulated," said Leiggi, who is now the museum's director of paleontology, looking down on the shallow dent still visible decades later. He kicked at a chip of Reagan-era plaster. "I should have done a better job cleaning up this site."

Wankel's T. rex, estimated to contain almost 90 percent of the living animal's bones, quickly became a favorite with visitors and researchers alike.

"I've had a lot of T. rexes in my life, but MOR555 was special," said Mary Schweitzer, a paleontologist at North Carolina State University. Her work on the specimen as a graduate assistant led to her groundbreaking—and controversial—claims of finding molecular-level residue of blood cells and soft tissue in dinosaur fossils.

The Wankels enjoyed that the "Wankel T. rex" was so renowned. Replicas were made for museums in Scotland, Australia, and California. Kathy went on "To Tell the Truth," where David Niven and football star Lynn Swann grilled her about fossil finding. When the Museum of the Rockies put up a massive

**EXTRA SPECIAL DELIVERY** Top left: Jack Horner holds an arm of the Wankel T. rex as his team packs the bones for shipment to Washington, D.C. in 2014. Top right: Officials with the U.S. Army Corps of Engineers, official owner of the fossil, and the Smithsonian Institution celebrate the arrival of the Wankel T. rex from Bozeman. Above right: The Wankel skeleton is the museum's first T. rex and forms the centerpiece of a new 31,000-square-foot dinosaur and fossil hall that opened on June 8, 2019. Above left: Kirk Johnson, director of the Smithsonian National Museum of Natural History, and Lieutenant General Thomas Bostick, chief of engineers and commander of the U.S. Army Corps of Engineers, stand with Kathy and Tom Wankel at a press conference in 2017.

TOP LEFT: MIKE GREENER/*BOZEMAN DAILY CHRONICLE*; ALL OTHER PHOTOS: F.T. EYRE/U.S. ARMY

**DEATH POSE** At the Museum of the Rockies, the Wankel T. rex was displayed exactly as paleontologists saw it when they first uncovered the bones.

bronze cast of the skeleton out front, they went for another round of congratulations.

And then, in 2014, word reached the ranch: Their T. rex was heading to the nation's capital. The Smithsonian had arranged a 50-year loan with the Army Corps, the legal owners of the skeleton.

## DEATH POSE DRAMA

It was a bittersweet departure for many when they packed 16 crates of T. rex into a customized FedEx truck and pointed it east. A lot of Montanans like Montana fossils to stay in Montana. Johnson, at the Smithsonian, hopes they will take solace that it is likely to become the most viewed T. rex in history.

The 7 million people who visit the museum each year "are going to see it and know it's from Montana," he said.

It's taken a long time to make the shift. The Smithsonian spent five years completely renovating the fossil hall, revamping its collection and restoring the Beaux-Arts architecture. The T. rex, in the meantime, was going to stand up for the first time.

In Bozeman, the fossil had been displayed in an array of pieces, showing visitors what Leiggi and Horner saw when they first uncovered the bones.

"A death pose gives the visitors a chance to see what it looks like in the ground," Horner said.

The Smithsonian has opted for an action pose, sending the fossil to a firm in Ontario for mounting in a dramatic tableau of life and death on the subtropical basin that was Montana back, back, back in the day. Now, the fossilized T. rex is frozen in the act of chomping the head of a fossilized Triceratops. Whether it is the chomp of a predator or a scavenger is left for the visitor to imagine.

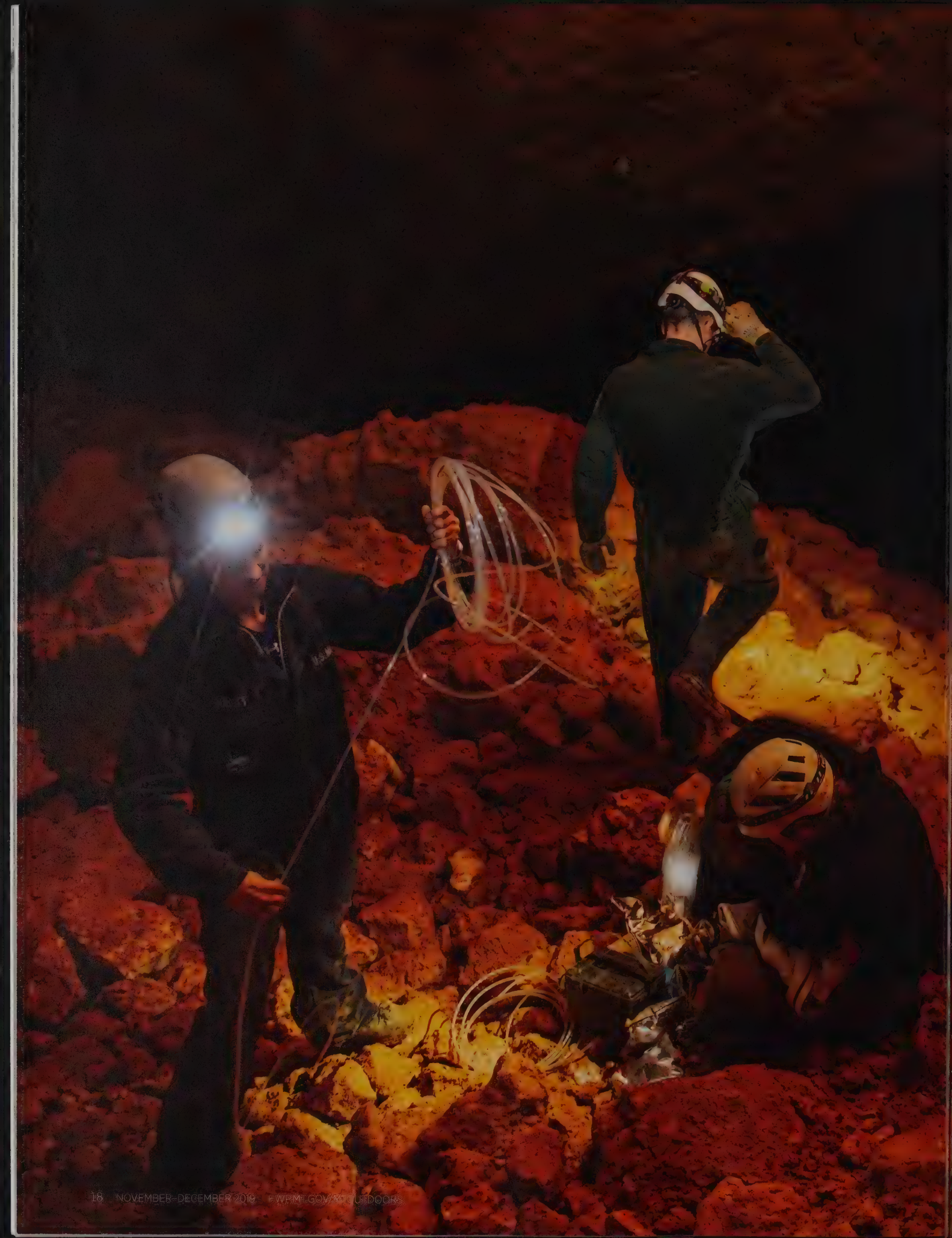
"People can think he killed it, but maybe he just found it," said Johnson, as his staff was putting the final touches on the new exhibit. "It's best to be clear about where your knowledge ends and speculation begins."

The Wankels and their three all-grown-up kids are coming to see their find take its place as Washington's newest bigfoot VIP. They will get a private tour of the exhibit and take in a Nationals baseball game. Tom will put on a black string tie for the opening gala crowded with people, some of whom have donated a lot of money to get their name on a plaque somewhere in the Smithsonian.

Kathy Wankel has her name on one by a different route. She came arm-in-arm with a dinosaur.

LEFT TO RIGHT: MUSEUM OF THE ROCKIES AT MONTANA STATE UNIVERSITY; ILLUSTRATION BY HERSCHEL HOFFMEYER

**FLESHED OUT RENDITION** An artistic imagining of a female Tyrannosaurus rex and her young roaming what is today Montana, 66 million years ago.



FWP and partner groups search Montana caves for signs of a disease that has killed millions of bats across the United States.

# Searching for Something They Don't Want to Find

By Karl Puckett. Photos by Rion-Norris Sanders

**"WHEN WE'RE ALL IN THERE,** I'll point out the dangerous spots and nurse you through them."

On a chilly early April morning, David Bobbitt is providing safety advice for several people snowshoeing to Lick Creek Cave in search of bats and signs of a bat-killing fungus moving across the eastern and central United States. This remote cave is deep in the Helena-Lewis and Clark National Forest near the Highwood Mountains east of Great Falls. Bobbitt, a geologist and cave manager for the national forest, warns that conditions will be dark, wet, and icy, and that ropes could be slippery. If someone is injured in the cave, it will take "a few days" for a search-and-rescue unit to arrive, he says. Then he makes sure each team member carries three flashlights or other light sources. "You don't want to be stuck down there for days in the dark." ▸▸

**INTO THE BAT CAVE** Roughly 100 feet underground in Lick Creek Cave near Great Falls, wildlife biologists and technicians unload gear used to test for the fungus that causes white-nose syndrome in bats. The disease has ravaged bat colonies across the eastern United States and is steadily moving west.

**INTO THE UNDERWORLD** Above: David Bobbitt with the U.S. Forest Service works his way down to the oven door-sized hole that leads into Lick Creek Cave. Below: The cave is one of only eight in Montana that hold more than 50 bats each winter. Bats congregate in these "hibernacula," making the caves prime areas for the fungus causing white-nose syndrome to spread.

Members of the crew strap on snowshoes, hoist 30-pound packs, and set off into the forest from a county road. After an hour of trudging through knee-deep snow, they arrive at a hole in the ground no bigger than an oven door. Crew members don helmets and swap snowshoes for knee pads before descending a rope—one by one—through the narrow opening. For the next five hours, they climb over jagged rock, scoot on their haunches, and even belly crawl to reach deep into the bowels of the cave. This is no place for the claustrophobic.

The crew is looking for signs of *Pseudogymnoascus destructans*, a fungus that causes white-nose syndrome (WNS) in bats. The disease has wiped out millions of hibernating bats in 33 states and seven Canadian provinces since it was first discovered in New York state in 2006.

Over the past 13 years, WNS has steadily moved westward, spread from bat to bat and possibly by recreational cavers and others who travel from cave to cave.

Last May 2019, it showed up in North Dakota, just 170 miles from the Montana border. The disease will inevitably arrive in Montana, if it's not here already, says Lauri Hanauska-Brown, chief of Montana Fish, Wildlife & Parks' Nongame Wildlife Bureau and a member of the Lick Creek Cave crew. She and other wildlife officials say that early detection may help decrease the spread and keep bat mortality as low as possible.

The visit to Lick Creek Cave is part of a statewide surveillance effort that began in 2012 and includes trips to remote caves throughout Montana to collect samples from bats and soils. "The clock is ticking," says Dan Bachen, senior zoologist with the Montana Natural Heritage Program. "We need to know as much as possible about bats and where they live so that when white-nose syndrome gets here, we're ready to monitor any changes in individual bats and bat populations."

## BAT BENEFITS

At stake are not just bats, but also ecosystems and agriculture. In other parts of the United States, native plants depend partly or wholly on certain bat species to pollinate their flowers. Some fruit plants rely on fruit-eating bats to spread their seeds.

But it's their insect-eating capabilities that make bats invaluable to people and farm economies. A single little brown myotis bat can consume up to 1,200 mosquitoes in an hour.

In addition to mosquitoes, which can carry West Nile Virus, bats eat agricultural pests. One Indiana study found that 150 big brown bats consumed roughly 1.3 million insects per year, many of them harmful to crops. Ian Foley, Pest Management Program manager for the Montana Department of Agriculture, says bats in Montana consume Hessian flies, orange blossom wheat midges, and cutworm moths that afflict wheat, corn, fruit trees, and nurseries. Nationwide, the value of bats in pesticide savings is estimated in the billions of dollars.

Montana is home to 15 bat species, some of which reside here year round while others migrate to Mexico and southern states in winter. During the day, bats roost in attics, caves, and talus slopes, and under bridges. For winter roosts (known as "hibernacula"), they seek deep caves where temperatures remain just above freezing.

Bats are one of the few animal species that use echolocation, by which they navigate to points as minuscule as a hair's width by emitting a sound and listening to its reflection. This allows the winged mammals to hunt and eat insects in the dark, when

*Karl Puckett is a staff writer for the* Great Falls Tribune *and Rion-Norris Sanders is a photographer for the* Great Falls Tribune.

rival bug-eating birds are asleep. By occupying an airborne ecological niche few other animals use, bats have evolved over the past 50 million years to be one of the world's most abundant and diverse orders of species.

Many people mistakenly assume that bats, which resemble mice with wings, are related to rodents. Actually, shrews, which are not rodents, are closer relatives.

Bats are the only mammal that can truly fly (northern flying squirrels glide). Like grizzly bears, bats live a long time. Several banded in 1989 in Montana's Pryor Mountains were recently recaptured, 30 years later. Also like grizzly bears, bats produce only one or two young ("pups") each year. If a colony is wracked by disease, it can take decades for numbers to recover.

That's been the case elsewhere in the United States, where WNS has killed between 5 million and 7 million bats.

## STARVING TO DEATH

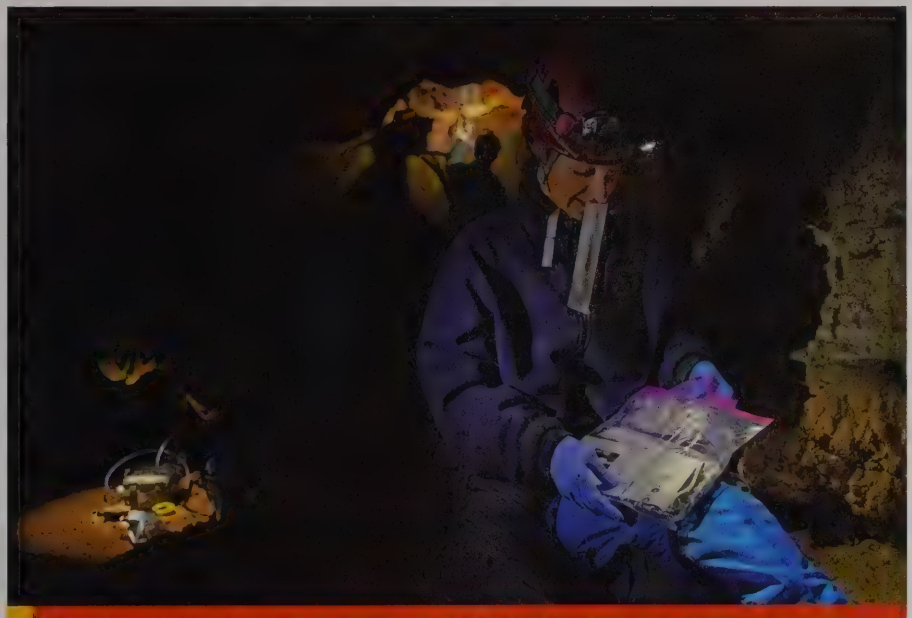
White-nose syndrome takes its name from the fungus—similar to severe athlete's foot—that often shows up on the face of afflicted bats. The fungus seems to have originated in Europe, where it has been less harmful to bats, perhaps because they have had much longer to adapt. People likely carried WNS to North America on clothes or caving gear.

Fungal infestations grow over the winter in the cool, damp environments of caves, making hibernating bats especially susceptible. In addition to the face, the fungus attacks bare skin on the animals' forearms. Symptoms worsen, wearing holes in the bats' wings. The irritation also arouses bats from their winter torpor. Grooming the affected areas burns up precious calories, resulting in starvation. In some eastern states, the disease has wiped out entire colonies. Emily Almberg, FWP disease ecologist, says there currently is no way to treat infected bats or prevent infestations, though researchers nationwide are searching for treatments.

No one knows how WNS will play out in the West, Almberg says. One major question is whether it will be as devastating here. Back East, tens of thousands of bats commonly hibernate in massive caverns. In Montana, only a handful of caves contain even a few hundred roosting bats. One is Lick Creek, which biologists estimate holds just over 150 bats each winter. Included are the Townsend's big-eared bat, western small-footed bat, long-legged myotis, fringed myotis, and little brown myotis. "The fungus may not thrive in the places where our bats hibernate," Almberg says. "Or it may not spread as quickly or extensively among bats hibernating in smaller groups or that are more dispersed as they are in Montana. These are things we're hoping will work in favor of our bats."

As for treatments, disease ecologists and wildlife biologists are investigating the possibility of placing ultraviolet lights near roosting entrances, Hanauska-Brown says. That quick exposure may be enough to kill the fungus. Also under investigation is applying anti-fungicide to the floors and walls, perhaps with drones. A third potential solution is applying a vaccine. "You couldn't vaccinate bats one at a time, but the vaccine could be transmitted in a dust sprayed into hibernacula. Assuming it would get on their fur, they would ingest it as they groom themselves," Hanauska-Brown says.

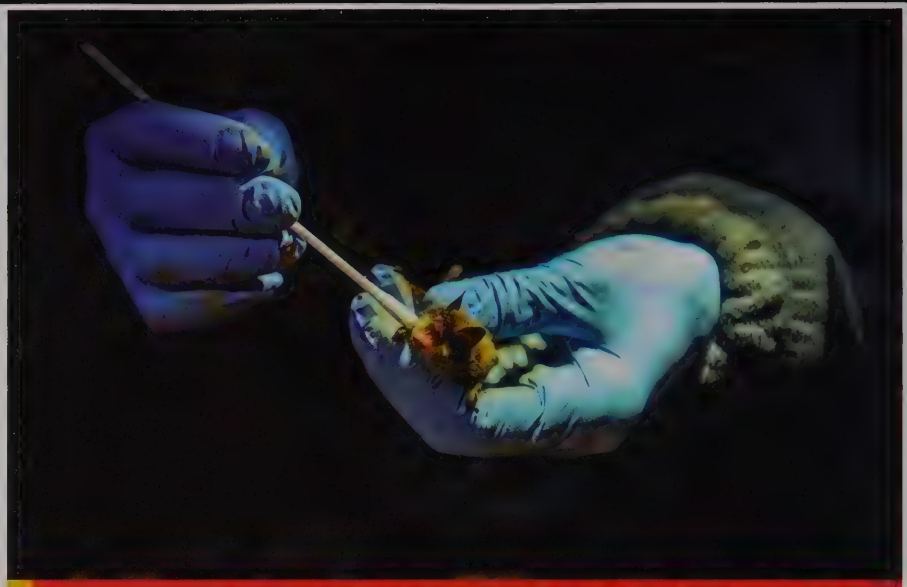
Each possible means of fighting WNS carries risks. A fungicide could also kill important native cave fungi. Ultraviolet



**CAVE DWELLERS** Lauri Hanauska-Brown, chief of the FWP Nongame Wildlife Bureau, removes materials she and others will use to test soil and capture and test species including the Townsend's big-eared bat, western small-footed bat, long-legged myotis, fringed myotis, and little brown myotis (below). FWP and the U.S. Forest Service have worked with the caving organization Northern Rocky Mountain Grotto to locate and access caves that need to be surveyed. "The caving community has been essential in helping us monitor for white-nose syndrome," Hanauska-Brown says.

bulbs could harm other cave-dwelling wildlife species vulnerable to that light spectrum. "It's like those warnings in prescription drug commercials on TV, 'Side effects may include...'" Hanauska-Brown says.

Despite the lack of proven treatments, Almberg says knowing where bats and WNS exist in Montana will allow for rapid action if scientists ever do discover a cure.



**UNDERSTANDABLY CRANKY** Woken from its winter slumber, a little brown myotis bat hisses as its fur is rubbed with a cotton swab (which later tested negative for the fungus). In eastern states, white-nose syndrome has killed millions of bats. The fungus attacks the flying mammals' face and the bare skin on their forearms, wearing holes in the wings. It also produces severe skin irritation, causing hibernating bats to wake and groom the affected areas, expending precious calories that results in eventual starvation.

### PARTNERS MOBILIZE

One silver lining to the impending WNS crisis is that it compelled partners to study bats in Montana like never before. Working with FWP to monitor WNS are the Montana Natural Heritage Program, U.S. Geological Survey National Wildlife Health Center, U.S. Forest Service, U.S. Fish & Wildlife Service, Bureau of Land Management, Department of Environmental Quality, and Northern Rocky Mountain Grotto, a caving group (see sidebar, below). The partners began meeting in 2010. "We knew WNS was heading west and wanted to begin bringing everyone together to conserve bats wherever it was possible," Hanauska-Brown says.

Teams began checking caves for bats in 2012 and now know where many of the mammals live and in what concentrations. "It's difficult to work on species that could face some pretty tough challenges without knowing much about them," Bachen says. "At least now we have enough information to manage them to the best of our ability."

Researchers found that most of the state's 400 caves don't have high numbers of hibernating bats. In fact, only eight contain more than 50 roosting bats. Bats also roost below bridges and in cliff crevasses, buildings, and constructed bat houses, but these are primarily summer roosts. Five caves used for hibernation were selected for WNS monitoring. Hanauska-Brown says results will help inform cave management decisions to limit the spread of the fungus, such as developing access and decontamination protocols for cavers and others who visit the sites.

## Cavers, FWP, and USFS team up to help bats

A major challenge for scientists trying to monitor bats for white-nose syndrome (WNS) is finding and accessing caves where the winged mammals live. "Most of us don't have experience in those underground environments," says Lauri Hanauska-Brown, chief of the FWP Nongame Wildlife Bureau.

In 2010, as WNS began rapidly moving west from eastern states, Hanauska-Brown reached out to members of the Northern Rocky Mountain Grotto. The organization of cavers promotes cave exploration, appreciation, and conservation. "We knew the caving community had information we needed, like cave locations, which caves had bats, and how to access caves safely," she says.

Zach Angstead, membership and engagement coordinator for the Montana Wildlife Federation and vice president of the Grotto, says the caving group welcomed the chance to partner with FWP and the U.S. Forest Service (USFS). "We were concerned they wanted to shut down the caves, but we also wanted to help keep bats safe by decontaminating our clothing and gear and observing where bats live," he says.

Over the past nine years, USFS and FWP officials have met regularly with the cavers, attending the group's annual meeting and providing regular updates on bat conservation and WNS. "One way we've built trust with the caving community is by making sure they are always in the room whenever we have discussions with the USFS and other partners," says Hanauska-Brown.

A little brown myotis bat with white-nose syndrome showing the irritating fungus on its face and wings.

Angstead agrees, and notes that exposure to bat-related information has made converts of him and his fellow cavers. "At first our main concern was just maintaining our access," he says. "But now we see that bats are part of the cave environment, and we want to do all we can to protect them."

## BACK UNDERGROUND

Halfway down Lick Creek Cave, Hanauska-Brown says she hopes to collect 25 swab samples on this visit. "We will certainly wake up a lot of bats today," she says in a whisper. The temperature inside is about 40 degrees; the air is thick with humidity.

One by one, team members squeeze through a foot-high passage on their bellies. At other spots, they use ropes to drop to different cave levels. Finally, they reach the "cathedral," a massive open space of roughly one acre with a ceiling that rises up to 100 feet in places. To illustrate how dark it is, Bobbitt asks everybody to switch off their helmet lights. "Sit down first," he warns, "or you may lose your bearings and fall over." The darkness is absolute; no one can see their hand in front of their face.

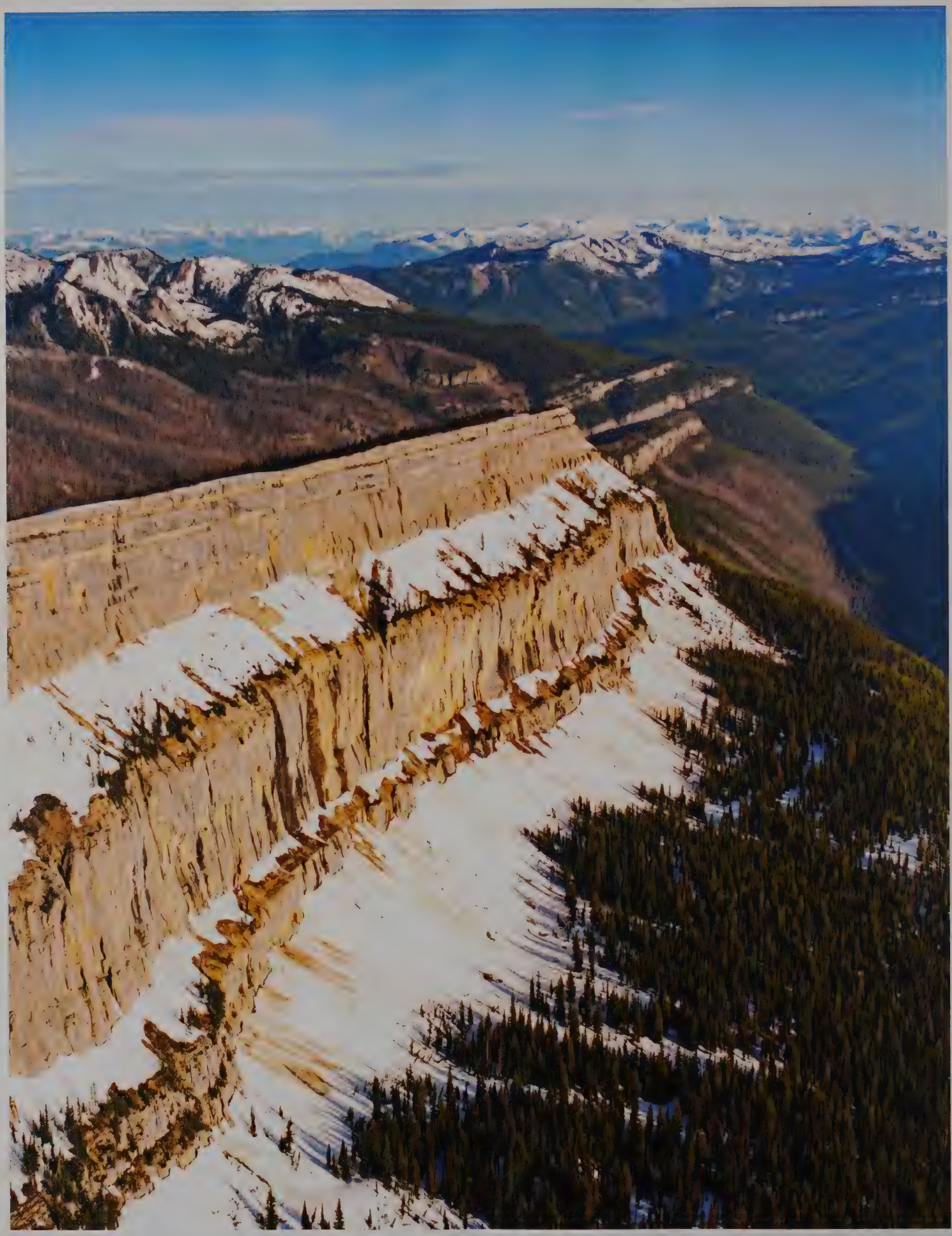
With her headlamp back on, Hanauska-Brown uses a paper cup taped to the end of a hiking staff to gently pluck a little brown myotis off a wall eight feet overhead. Aroused from its sleep, it hisses. "I'm sorry, guy," she says to the bat while holding it in her gloved hand, its tiny open mouth revealing sharp white teeth.

Hanauska-Brown illuminates it with her headlamp and works quickly. Once awakened from its winter torpor, a bat's metabolism speeds up, forcing it to burn calories essential for surviving the rest of hibernation. As she will for the other bats captured this day, Hanauska-Brown brushes a cotton swab over its nose before putting the tiny creature near the cave wall, where it will climb back to its hibernation spot. "If there's fungus on his little body, it's now on this swab," she says.

Later biologists learned that this bat and all the others they sampled last spring in Lick Creek and three other Montana caves were free of the fungus. For now.

"To tell you the truth, I was surprised that the fungus didn't show up," says Hanauska-Brown. "We'll be back next spring, and none of us will be shocked one bit if we find it then."

**INTACT MEMBRANE** Hanauska-Brown checks the wing of a bat for signs of white-nose syndrome. So far, the disease has yet to show up in Montana, though it was recently documented in North Dakota just 170 miles east of the border. Officials with FWP and other agencies are documenting where bats live in the Treasure State so that if—or, more realistically, when—WNS arrives, they can move quickly to limit its spread and harm to Montana's bat populations.



# THE GREATEST DIVIDE

## How the Continental Divide shapes Montana's weather, landscape, economy, and culture. By Eric Heidle

On September 30, 1911, a small knot of people wearing their Sunday best stood in a mountain meadow on Mullan Pass, 12 miles west of Helena. They had built a large bonfire and watched as a small airplane approached from the east. Craning their necks, they could clearly see the pilot. One young woman clothed in her finest Victorian dress and hat would later remark, "It was the most wonderful sight I'd ever seen." Her name was Margaret McDonald, and she was my great-grandmother.

Margaret was right to be amazed. The bonfire had been built to guide the plane, which had no electronic navigation. Built on a wood-and-canvas frame, the aircraft strained to reach the altitude necessary to cross the 5,900-plus-foot pass. The pilot, a 19-year-old Ohioan named Cromwell Dixon, would earn a $10,000 prize for his feat of derring-do.

Because this was no ordinary flight over the Continental Divide; it was the very first.

The Continental Divide has been shaping fortunes in Montana for a long time, but to get to the beginning you have to go back about 60 million years. Deep beneath the North American continent and unusually far inland, a massive tectonic subduction plate began diving under remnants of an older mountain range, pushing up a vast, high plateau like a giant foot furrowing a rug. Erosional weathering and glaciation gradually sculpted this plateau into the Rocky Mountains, and along it an invisible line that literally divides the continent.

### WATER GOES EITHER WAY

A continental divide is the line along which all water on one side flows to one ocean, and all water on the other flows to another. The Continental Divide running through Montana actually extends from the tip of Alaska to the bottom of South America, the Rockies and Andes separating the waters flowing to the Pacific and the Atlantic. It's easy to imagine these massive watersheds being split by the mighty elevations of Montana, Argentina, and...North Dakota?

That's right. Although the Peace Garden State's high point is below 3,000 feet, a continental divide splits it in two lengthwise. Called the Northern or Laurentian Divide, it sends waters either north into Hudson Bay via Manitoba or south into the Gulf of Mexico by way of the Missouri River. The subtle contours of every landscape must send water somewhere, and there's always a divide.

The Laurentian Divide connects to the Continental Divide in Montana atop a minor nubbin of rock in Glacier National Park. Triple Divide Peak is small by Glacier's standards, but stand at its summit and pour a bit of water at your feet and the fluid could conceivably trickle its way to the Pacific, the Arctic, or the Atlantic. Called a hydrologic apex, these spots are generally regarded as the high point of all drainage basins on each continent—the Mount Everests of water.

Divides go where they will, and Montana's in particular zigzags, generally north to south. But it takes some hard turns. The Continental Divide lassos Butte into a little corner of the Pacific drainage, for example, while Dillon,

**HISTORIC FLIGHT** Above: Ohioan Cromwell Dixon, age 19, lands his wood-and-canvas biplane near Elliston on September 30, 1911, after departing Helena. This was the first flight over the Continental Divide. Facing page: In the Bob Marshall Wilderness, roughly 100 miles northwest from where Dixon made his historic crossing, the Chinese Wall stands as one of the Divide's most striking geological features.

LEFT TO RIGHT: MIKE HINES; LIBRARY OF CONGRESS

which sits south and ever so slightly west of Butte, actually drains to the east. This turn in the Divide also sunders Opportunity (which drains east) from Wisdom (which drains west). Traversing this serpentine boundary, a person driving I-15 between Helena and Idaho crosses the Divide three times.

## CLIMATE CHANGER

The Divide cleaves more than watersheds. It separates much of Montana's weather, vegetation, industry, economies—even culture.

Above the Divide, Pacific air masses move east until they strike the Rockies, then rise and cool to drop rain or snow onto the state's mountainous west. This moisture hoarding creates vast forests and complex river systems benefiting downhill skiers and bull trout. The forests and mountains sustain logging and mining.

East of the Divide, after the clouds are wrung dry, farmers, ranchers, and fish make do with less. Here cattle grazing and dryland farming rule—except where irrigation brings water directly to crops and pastures.

While water flows downhill, Montanans are increasingly moving uphill. West of the Divide, people are drawn to skiable mountains, trout-rich streams, and postcard vistas of snowcapped peaks. Our population centers have been drifting westward and uphill toward the Divide in response. Fortunately, Montana maintains a coherent identity despite having such a literal geographical division. While a rancher in Ekalaka might have little in common with a social worker in Missoula, both pride themselves on their identity as Montanans.

The Divide has shaped man-made boundaries for longer than Montana has been a state. In 1803, President Thomas Jefferson sent James Monroe on a boat headed for France to join America's foreign minister Robert Livingston in Paris. Their mission? To haggle with Emperor Napoleon Bonaparte for French lands east of the Mississippi River. The duo was authorized to spend up to $10 million for New Orleans and as much of Florida as they could obtain. By the time Monroe reached French soil, though, Livingston informed him that a lot more was

LEWIS & CLARK PASS
CAPT. MERIWETHER LEWIS, ON HIS RETURN JOURNEY, CROSSED THE CONTINENTAL DIVIDE THROUGH THIS PASS ON JULY 7th 1806.
HELENA-LEWIS AND CLARK NATIONAL FOREST

**CONTINENT CLEAVER** Above: The Continental Divide as it runs from Alaska into South America. Below: A sign near Lincoln marks where Meriwether Lewis crossed the Divide on his return voyage.

up for grabs—the entire Louisiana Territory.

Comprising most of the land between the Continental Divide and the Mississippi River, Louisiana Territory was enormous. Acquiring it would double the size of the United States, secure river access to the continent's interior, and stave off encroachment from European powers. But Napoleon's asking price was half again as much as the Americans' $10 million budget. Monroe and Livingston gave thoughtful consideration to this new offer, then did what any pair of free-wheeling employees with an expense account and no way to call the home office would do. They agreed to the emperor's price and bought it all.

The Louisiana Purchase was the land deal of the century, and it made the Continental Divide the far western border of the United States. Keen to learn what his men had spent all that money on, Jefferson organized an expedition to seek out a water route to the Pacific. The journey would be led by Captain Meriwether Lewis and Lieutenant William Clark.

Lewis and Clark notched many firsts for European Americans in what would become Montana, including crossing the Divide. Lewis and three of his men did so by reaching Lemhi Pass (50 miles west of Dillon on what became the Montana-Idaho border) on August 12, 1805. There the Corps of Discovery descended west into the territory of Sacagawea's people, the Shoshone Indians, where they discovered vital—and tasty—proof they'd crossed the Divide.

Fishing was of keen interest, both for scientific knowledge and keeping bellies full, and the corps had sketched and eaten its way up the Missouri River from St. Louis. But once across the pass, Lewis and Clark got their first taste of a species they'd found nowhere else on their journey: salmon, a major food source for the Shoshones. Lewis quickly surmised that they'd crossed a key divide and were now close to reaching their westward waterway to the Pacific. Clark and a few men tried to follow the tumultuous Salmon River farther downstream, nearly drowning in the attempt. So the expedition returned back east over the Divide on the Shoshones' advice. They made their way north along the Bitterroot, eventually crossing the Divide again, this time at Lolo Pass, to reach the Columbia Basin.

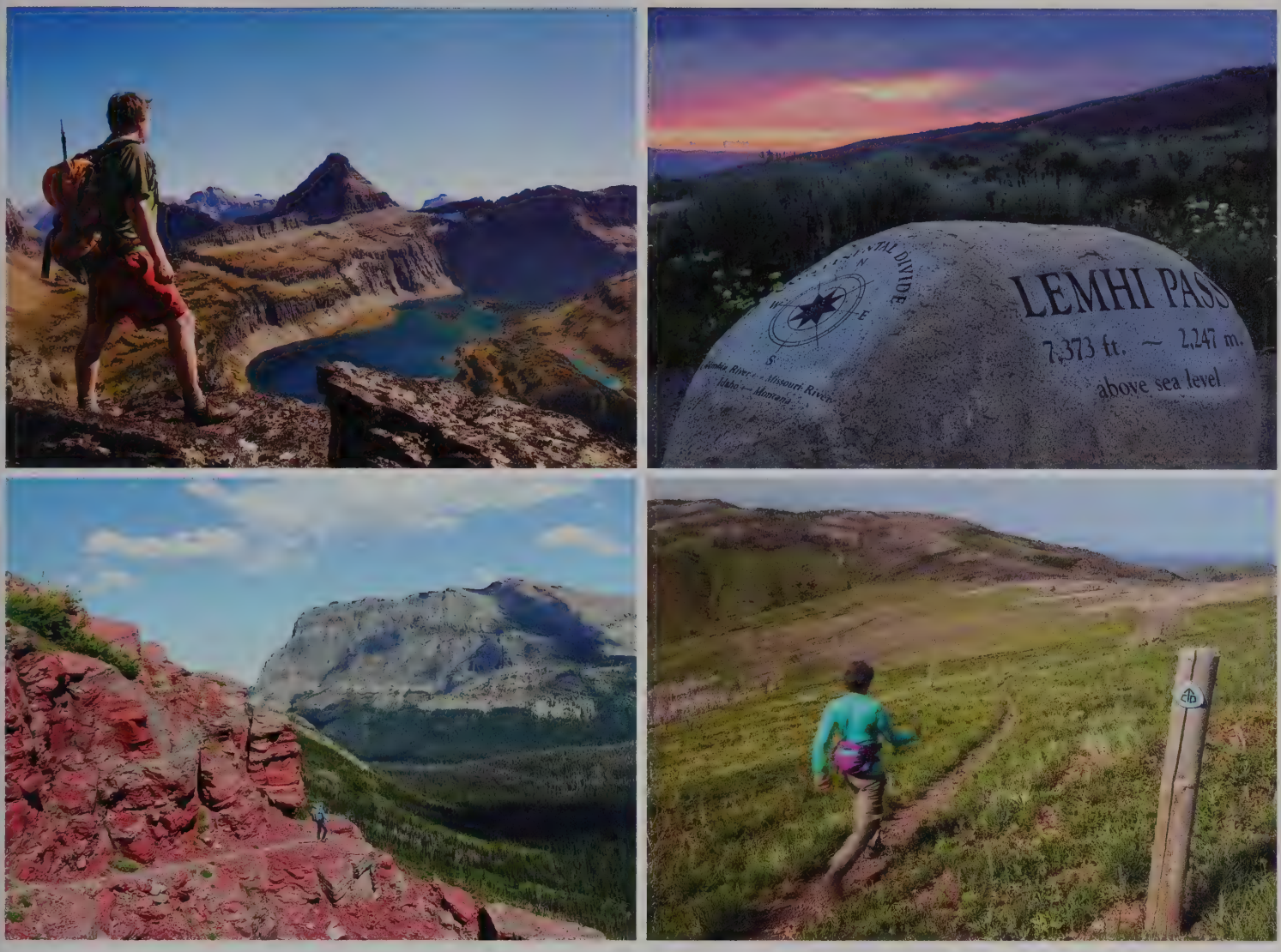
## LONG WALK

As dawn breaks on a recent summer day, I am standing atop Logan Pass in Glacier National Park surrounded by some of the most stunning mountain scenery anywhere on the Divide. It's also a parking lot. I'm watching a line of extremely fit runners disappear north along the Highline Trail. Following the Divide much of the way, they don't plan on stopping until they reach Canada, some 38 miles off. I'll beat them there—but by a saner route. I've been recruited to drive the shuttle van around to Waterton Village in Canada's Waterton-Glacier International Peace Park.

First I take in the view. Peaks vault upward in all directions, mountain goats and bighorn sheep stroll casually by, and above me the Divide runs atop the razor-sharp arête of the Garden Wall, slicing the park and eventually a continent in two.

*Eric Heidle is a writer and photographer in Great Falls.*

TOP TO BOTTOM: LUKE DURAN/*MONTANA OUTDOORS*; RICK CLARK




**HIKING THE DIVIDE** Clockwise from top left: Looking down at Hidden Lake in Glacier National Park just west of the Divide near Logan Pass; a marker at Lemhi Pass on the Idaho-Montana border in southwestern Montana shows where Lewis and Clark first crossed the Divide in 1805; a hiker passes a Continental Divide Trail (CDT) marker at Lewis and Clark Pass; descending Triple Divide Pass on the CDT above Atlantic Creek in Glacier National Park.

The Highline Trail is one end of a much longer walk. Recently, while descending Rogers Peak near Lincoln, I met three backpackers moving quickly south. I asked how far they were going and one replied, "Mexico." They were through-hiking the Continental Divide Trail, a 3,100-mile route from the Canadian line to the Mexican border. Each year hardy adventurers walk its length before winter snows close in. But the most historically significant trail aligned with the Divide is found some 30 miles east—on the edge of the Great Plains.

Called the Old North Trail, it's one of the world's oldest human tracks. Begun at the end of the Pleistocene glaciers' retreat, it's been traveled for perhaps 12,000 years. Prehistoric sites, artifacts, and oral traditions point to its continuous use during that time; the Blackfeet tell of walks lasting a year to lands of "dark-skinned people," perhaps in the American Southwest or even Mexico. And they did it without CamelBaks or graphite trekking poles.

## MISSING TREE

The forces that directed early peoples' movements—gravity, temperature, and geology—also shaped the Divide, and continue to shape it today. Even trees can play with our perceptions of where the true line lies.

In 1982 Margaret McDonald, who by then was 92-year-old Margaret "Maggie" Davis, happened to see Helena artist Robert Morgan's painting of Cromwell Dixon's flight across the Divide—and she had a quibble with it. The terrain didn't match her memory of a giant, lone pine at the edge of the meadow where Dixon landed. A reporter at the Helena *Independent Record* got wind of this and brought her, Morgan, and another eyewitness, rancher John Senecal, up to Mullan Pass to see if they could locate the true site.

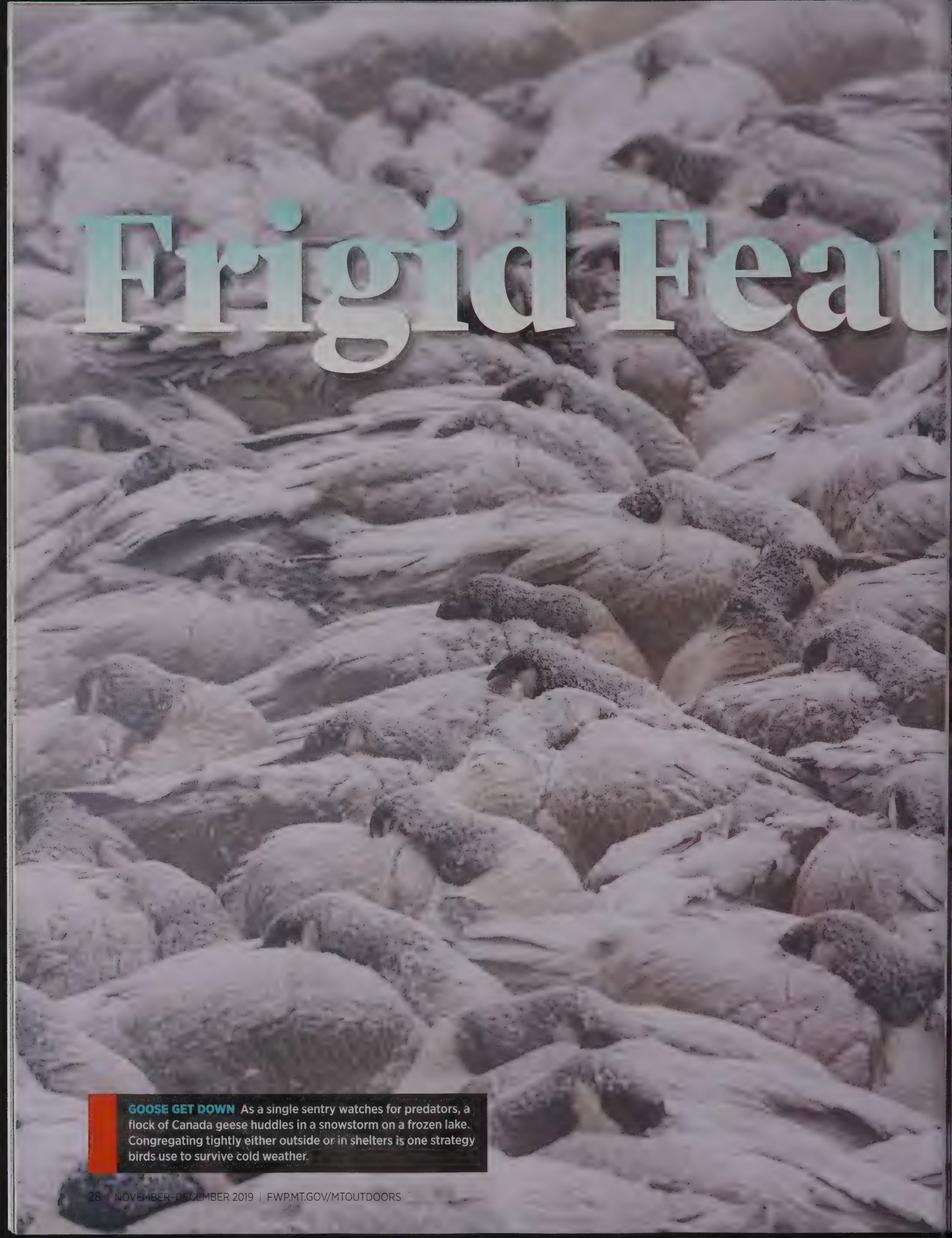
The tree is clearly visible in one of the 1911 photos, but at first the group couldn't find it. Morgan began strolling back into the timber for a closer look. About 50 feet in, he found the massive pine. An entire forest had grown up around it in the intervening decades.

People have been discovering and rediscovering features of the Continental Divide for ages. This vast geological feature continues to exert its pull on our lives and imaginations. It shapes landscapes, fuels livelihoods, sparks a sense of wanderlust, even lodges in our memory. It's a golden spine that snakes through our state and knits it together, despite its name. We Montanans could be forgiven for calling it, simply, the Greatest Divide.

*Robert Morgan's painting of Cromwell Dixon's historic flight is on permanent display in the Helena Regional Airport lobby.*

CLOCKWISE FROM TOP LEFT: ERIC HEIDLE; DEE LINNELL BLANK; DEE LINNELL BLANK; DAN OLDENBURG

# Frigid Feat



**GOOSE GET DOWN** As a single sentry watches for predators, a flock of Canada geese huddles in a snowstorm on a frozen lake. Congregating tightly either outside or in shelters is one strategy birds use to survive cold weather.

RODNEY SCHLECHT

# hers

## The ingenious ways birds stay warm through Montana's long, cold winters.

By Ellen Horowitz

On a crisp November morning, a flock of snow geese glistens in the sunlight against the bright blue sky. My husband and I stop to watch the dazzling spectacle from a ridgetop along the Rocky Mountain Front. By the time the birds disappear, I'm ready to resume our hike and shake off the chill. As we walk, Frank recalls the fable an old-timer told us decades ago: People once believed that hummingbirds rode on the backs of geese during migration. Because how else could those tiny birds travel thousands of miles twice each year?

The endearing image of a tiny, long-billed passenger nestled into the protective warmth of goose down made me smile. It also made me wonder: How do birds that don't migrate actually stay warm during Montana's longest and coldest season?

### DOWN COATS

Birds are warm-blooded animals that must maintain a constant body temperature of 105 to 108 degrees F. To make and retain enough heat when outside temperatures can fall more than 100 degrees below their body temperature, they've devised a wide range of strategies.

Feathers provide the first line of defense. Birds fluff their feathers to retain body heat. The more fluff, the better the insulation. That's because it's the air within feathers that traps warmth.

To keep feathers fluffy and functioning, birds spend a lot of time preening. Using their beak, they take oil from their preen gland, located near the tail base, and spread it onto their plumage. Contrary to popular belief, the preen oil alone is not responsible for water rolling off a bird's back. "It's the microstructure of the feathers that makes them water repellent," says Jeff Marks, co-founder of Montana Bird Advocacy and co-author of *Birds of Montana*. When a bird preens, it adds a conditioner while realigning feathers and reconnecting the Velcro-like feather barbules that may have separated.

Not only do birds plump their plumage in winter, they carry more of it. In June, American goldfinches are covered with roughly 1,500 feathers, while in winter they grow another 500—the equivalent of you putting on an extra down jacket. American dippers—small, stout aquatic songbirds known for their swimming and underwater walking skills in swift-flowing streams—grow extra-dense contour feathers and down during winter. While passerines (songbirds) of similar size

*Ellen Horowitz is a longtime contributor to* Montana Outdoors. *She lives in Columbia Falls.*

CLOCKWISE FROM TOP LEFT: JAY CROSS; KEN ARCHER; ERIN BRAATEN; DICK WALKER

**SURVIVAL STRATEGIES** Top left: Clark's nutcrackers survive winter by feeding on whitebark pine seeds they hid in the ground months earlier; a single bird can recall thousands of cache sites. Top right: A regular winter visitor from northern Canada, the common redpoll burrows into snowbanks, where the temperatures can remain much warmer than outside. Above right: Mountain chickadees and red-breasted nuthatches will join crows and magpies to feed on the carcasses of deer and elk killed by hunters, predators, and vehicle collisions. Above left: American dippers seem oblivious to winter, feeding on underwater insects year round by walking along the stream bottom, water beading off their dense plumage.

average fewer than 3,000 feathers, dippers average about 4,200. Their ability to shed water is unmatched, says Marks: "Dippers are the poster child for water beading."

Birds also lessen heat loss by tucking their head into their shoulder feathers, similar to when you pull a neck scarf up and over your mouth and nose.

## SHELTERS FROM THE STORMS

For many birds, small ones especially, feathers alone aren't sufficient for surviving frigid nights that can last for 15 hours. To survive, Marks says, birds spend winter nights in microsites warmer than their surroundings. Chickadees, red-breasted nuthatches, and woodpeckers roost in tree cavities at night and during days of freezing temperatures and high winds. Pygmy nuthatches, gregarious little birds known for roosting in family groups year round, share space with multiple family groups during winter. Often dozens of birds will huddle together to maintain their warmth within a tree cavity. Inside, they stack up like little acrobats forming pyramids, squares, rectangles, oblongs, or other geometric configurations. Groupings of 100 or more pygmy nuthatches have been recorded in single roosts in Colorado and Arizona. Such tightly packed quarters provide plenty of warmth, but come with the risk of suffocation from overcrowding.

Paul Hendricks, Montana Bird Advocacy's senior scientist, says some birds use snow-covered shelters for thermal protection. To escape howling, heat-sucking wind, birds seek dense thickets and brush piles or move to the lee side of a tree or shrub. Golden-crowned kinglets, Montana's smallest year-round resident birds, stay cozy by huddling shoulder to shoulder in small groups among inner branches of conifers.

White-tailed ptarmigan and ruffed grouse commonly use deep, powdery snow for thermal cover. Hiking through an aspen forest in winter, you can occasionally see holes in the snow with wing prints on either

CLOCKWISE FROM LEFT: STEVE OEHLENSCHLAGER; SHARON DEWART-HANSEN; GARY KRAMER

**STAYING PUT** Top left: Redheads stay in Montana well into November. Like other waterfowl, they can stand for hours on snow and ice thanks to a heat exchange system that keeps warm blood flowing to the extremities. Top right: The lapland longspur is an Arctic breeder that winters in eastern and central Montana, where large flocks feed in windswept grain fields. Above right: Like many birds, white-tailed ptarmigan burrow in snow to stay warm. Their feathered feet work like snowshoes, enabling the birds to walk across deep snow. Other species with feather-covered feet include rough-legged hawks, sharp-tailed grouse, and several owl species.

side where a ruffed grouse has burst out after spending the night. Temperatures in a snow roost range from 32 to 20 degrees, far warmer than the much colder conditions outside. Common redpolls and snow buntings—two of Montana's winter visitors from the far north—also burrow into snow in extreme weather.

Hendricks says that in late fall, gray-crowned rosy-finches migrate from rocky alpine slopes to lower elevations where they huddle together in small, shallow caves and abandoned cliff swallow nests. The ornithologist documented a group of about 60 rosy-finches near Virginia City that roosted in an old mine shaft 30 feet underground. On a cold February day, he recorded the outside air temperature at -19 degrees F while the microclimate inside the mine shaft registered a balmy 49 degrees.

Just as birds work on escaping the cold, they also soak up any warmth they can find, particularly from the sun. On calm days with blue skies, sharp-tailed grouse and other birds perch in trees for hours with their backs to the sun, even if air temperatures are below zero.

Another strategy is to slow the body's metabolism to burn fewer calories. Black-capped chickadees, for example, lower their body temperature at night by 12 to 15 degrees in a process called regulated hypothermia.

## FOOD = WARMTH

While birds try to keep from burning too many calories, at the same time they spend all their waking hours looking for food to replace calories lost to the cold. That's a challenge when seeds and other foods are buried under snow. Chickadees, nuthatches, and redpolls hang upside down to reach food beneath tree branches and in nooks most birds can't reach. Many species form flocks to increase the number of eyes looking for edible items. Even though food must be shared among the group, even a modest portion of something is better than nothing.

Another strategy is food caching. Crows, ravens, jays, nutcrackers, and magpies stow

food in summer for later use. Clark's nutcrackers, well-known for caching whitebark pine seeds in the ground, possess the remarkable ability to recall thousands of cache sites. Gray jays slather their food items with sticky saliva and hide them in tree bark, twigs, foliage, and lichens for later consumption. Steller's jays are scatter hoarders, stashing seeds or other edibles in dispersed, concealed locations. If a jay suspects that another bird has seen it storing food, it will wait until the suspect flies off and then re-cache it.

Chickadees also stockpile. The next time you see one at your feeder, note how often it flies away with seeds rather than staying and eating them as most other birds do. Though they cache food year round, in the fall they increase the number of food items they stash each day. Scientists have found that the hippocampus of a chickadee's brain grows by 30 percent during the fall to help it recall those hundreds of locations. As spring approaches and fresh food is more readily available, the bird's brain shrinks.

Rather than relying on food caches, redpolls, crossbills, and grosbeaks gather as many seeds as possible each day and fill up expandable throat pouches before roosting for the night. Seeds stored in these built-in grocery sacks become available for midnight snacking. Scientists have found that common redpolls can hold up to 15 percent of their body mass in seeds.

Some birds change their diet during winter. "Ruffed grouse and dusky grouse undergo physiological changes that help their digestive organs switch from energy-rich insects and flowers of summer to the conifer needles and buds they consume all winter," says Marks.

## SNOWSHOES AND TOE WARMERS

Lacking fat and, for most species, feathers, a bird's feet are particularly vulnerable to winter's worst. Many birds tuck a foot into their belly feathers and alternate from one foot to the other. Some, like gray jays, squat while perched, covering their feet with their thick, fluffed-up plumage.

Hendricks notes that owls, rough-legged hawks, white-tailed ptarmigan, and sharp-tailed grouse all have feathered feet, which no doubt makes standing in snow more comfortable. "Feathered feet can also act like snowshoes by increasing surface area and distributing weight while a bird walks on snow," he says.

Hendricks adds that each fall, ruffed, spruce, and dusky grouse grow skinlike fringes, called pectinations, along either side of their toes. The scaly growths increase the foot's surface area while also acting as crampons to help the birds walk and stand on icy tree branches.

What about birds that stand on ice all day? Many mallards and Canada geese remain in Montana all winter, often spending hours on frozen lakes. Jim Hansen, FWP Central Flyway migratory bird coordinator in Billings, says the birds' webbed feet won't stick to the ice, a common myth. He explains that the upper legs of ducks, geese, and other species contain a countercurrent heat exchange system made up of an intricate, netlike pattern of arteries and veins. Warm arterial blood traveling down from the bird's heart intertwines with colder venous blood traveling up from the feet. Tissues in the feet receive just enough warm blood to prevent them from freezing—or sticking to ice—while the returning venous blood warms the body enough to prevent hypothermia.

It's hard to believe that a duck can stand on ice without freezing its feet off. Harder still to fathom a tiny chickadee surviving Montana blizzards. Yet they and other birds somehow manage to survive even the coldest conditions. While bracing for another long winter, we humans might want to keep those hardy, resourceful birds in mind. If they can make it to spring, we can, too. ■

# Does winter feeding help or hurt?

More than 50 million Americans put up backyard bird feeding stations, according to a U.S. Fish & Wildlife Service report. But does feeding birds in winter help?

"Yes and no," says Allison Begley, avian conservation biologist for Montana Fish, Wildlife & Parks. "It helps during times of difficult weather and food shortages." But it also can be harmful, she adds, because disease transmission increases whenever wildlife is artifically concentrated. "If you choose to feed birds, you do them the biggest favor by regularly cleaning your feeders," Begley says.

Feeders can also increase fatalities from window strikes and predators—particularly cats, which pounce on ground feeders like dark-eyed juncoes that congregate below feeders.

FWP regulations allow "recreational feeding of birds" as long as it does not "attract cloven-hoofed ungulates, bears, or wild turkeys."

Steller's jay with backyard peanut

Begley notes that backyard birds obtain only a small portion of their food from feeders. Approximately 75 to 80 percent of their diet comes from natural sources. Feeding doesn't affect bird populations one way or another, she adds.

It also doesn't alter birds' migratory habits, says Jeff Marks, executive director of Montana Bird Advocacy. Longer or shorter day length is the cue for most birds to migrate, not the length of time a backyard feeder remains stocked: "Most birds are calendar migrants. Changes in daylight hours trigger a strong cascade of physiological changes that cause them to migrate regardless of food availability."

Perhaps the greatest benefit of feeding, Begley says, is the enjoyment, appreciation, and connection to nature derived from watching and learning about birds: "You don't see as many different species in winter, but the ones you do see are real active for much of the time." ■

LEFT TO RIGHT: FRANCIS AND JANICE BERGQUIST; DONALD M. JONES

**WELCOME BACK** Snowy owls appear in Montana every several years when numbers of lemmings, their preferred prey, decline from natural population fluctuations. The birds arrive from the Arctic tundra in what's called an "irruption," or influx of a species into an area.

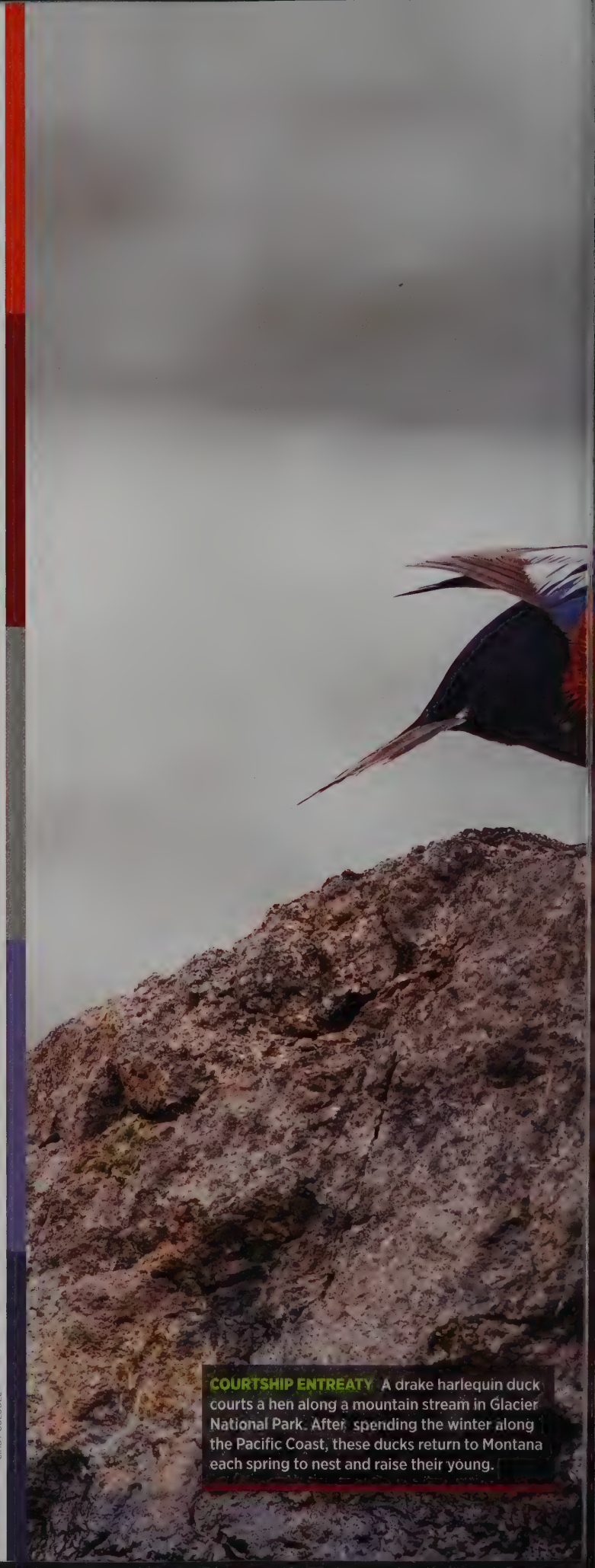
# Grim Future for a Festive Bird?

FWP biologists and others track harlequin ducks to learn why populations appear to be declining. By Laura Lundquist

ON MAY 1, 2018, AT HIS OFFICE in Kalispell, Chris Hammond opened his computer to check the location of 15 radio-tagged waterfowl he'd been following for months. He'd yet to see a GPS signal flicker on his Montana map. But that morning, there it was. In the foothills of the Cabinet Mountains near the Idaho border, about 35 miles south of Libby, a point flashed. Harlequin ducks were returning.

Over the winter, the Montana Fish, Wildlife & Parks nongame wildlife biologist had watched the drake harlequin points pulse along the Pacific Coast between Alaska and Seattle. Harlequins are sea ducks, spending most of the year surfing saltwater among seagulls and cormorants. But in the spring, they nest inland on fast-moving mountain streams, where they feed on aquatic insects by swimming underwater and probing bottom cobble. Hammond was relieved to see that his research birds had made it back to Montana. "There's a lot of mortality during migration, so you never know," he says.

Harlequin ducks are among Montana's most obscure



CINDY GOEDDEL

**COURTSHIP ENTREATY** A drake harlequin duck courts a hen along a mountain stream in Glacier National Park. After spending the winter along the Pacific Coast, these ducks return to Montana each spring to nest and raise their young.

**LUNCH BREAK** A trio of male harlequins rests on a mid-stream boulder. During the summer, the mountain ducks swim underwater in swift current to feed on aquatic insects.

waterfowl. Small ducks about the size of blue-winged teal, they are rarely seen here by anyone except backcountry hikers, outfitters, and anglers. And even then the birds might go unnoticed if not for the males' striking plumage. Named for the colorfully costumed servant characters in classical European theater, the male harlequin is distinctively marked with a slate-blue body, white facial crescent and head spot, rust-red crown and flanks, and bold white and black body stripes. While hen harlequins are a modest brown with white markings, drakes rival male wood ducks as the state's most colorful waterfowl species.

Harlequin ducks are well known to people along the Pacific seashore, where bird biologists and citizen scientists report steady population declines. In Canada's Strait of Georgia, an arm of the Pacific between Vancouver Island and Vancouver, British Columbia, scientists estimate the population is decreasing 2.6 percent per year. Another coastal population has declined by nearly 50 percent during the past four decades. Breeding numbers are dropping, too. In Banff National Park in Alberta, harlequin pair numbers have dropped from 90 to 25 since 1995.

Threats include water pollution, climate change, road building, mining, and disturbances by backpackers and other mountain visitors during nesting season. The long-lived birds, surviving up to 18 years, are slow to reach reproductive age and breed sporadically, producing no young some years and large broods of up to 10 ducklings in others.

All northwestern states in the United States have listed the harlequin as a Species of Greatest Conservation Need.

While biologists are trying to learn exactly why harlequin numbers are dropping, bird conservationists worry that an *Exxon Valdez*–type accident could wipe out the Strait of Georgia population if Canada moves forward with plans to ship Alberta tar-sands oil out of Vancouver ports. Harlequins didn't return to Alaska's Prince William Sound for 25 years after the *Exxon Valdez* spill.

An oil spill could mean far fewer harlequin ducks in Montana during the spring and summer. That's when the birds journey hundreds of miles from the coast to breed along the icy streams of the Rocky Mountains. Males linger only about six weeks, leaving females to raise the chicks until they and the young head to the Pacific Coast in September.

Until recently, scientists had scant data on harlequin ducks in Montana, so they were unsure if numbers here were declining. But during the past decade, they have tracked several dozen birds and discovered new migration movements and activities. "The more I did this, the more I realized just how little we knew about this species," says Lisa Bate, a wildlife biologist at Glacier National Park who has been banding and tracking harlequins since 2011.

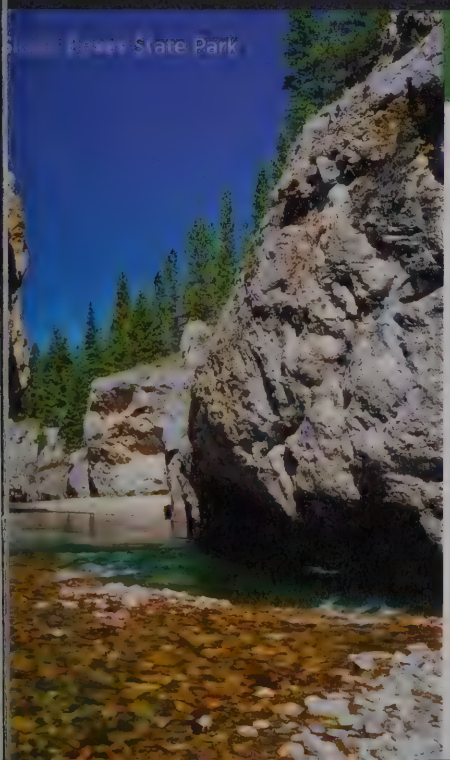
## TINY TRANSMITTERS

In 2015, biologists from across the Pacific Northwest joined forces to tease apart the harlequin life cycle and learn where to focus conservation activities. Since life for most harlequins begins in the Rockies, FWP biologists, along with those in British Columbia, Alberta, Washington, and Wyoming, have tagged ducks in early summer for the past

**DATA RECOVERY** Below: Glacier National Park wildlife biologist Lisa Bate and FWP nongame wildlife biologist Chris Hammond with harlequins located by tracking a GPS device surgically implanted in the drake's abdomen. A geolocator (right) on the hen's leg band records information used to determine nesting success.

CLOCKWISE FROM TOP LEFT: DAWN Y. WILSON; JOHN ASHLEY; DICK WALKER

*Laura Lundquist is a writer in Missoula.*



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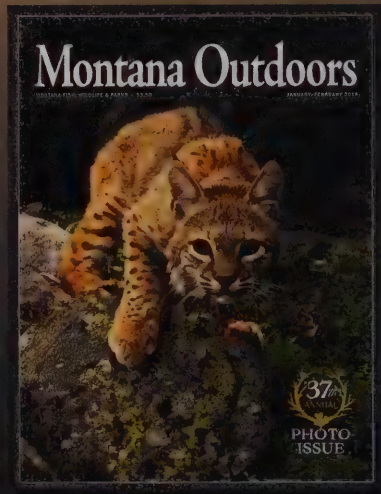


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four years. Thanks to recent technological advances, wildlife agencies can now afford miniature GPS devices that allow them to learn more about the harlequin's reproductive success and annual migrations.

Veterinarians carefully implant platform terminal transmitters (PTTs) in the males' abdomens. The thumb-sized devices, which cost $1,800 and weigh just 26 grams (less than 3 percent of the duck's weight), broadcast an instantaneous signal that biologists track to locate the males, and females by association, for up to three years. Because females can't produce eggs with transmitters in their bellies, biologists attach tiny $200 geolocators to the hens' leg bands. The geolocators measure daily light levels, which can be used to determine if a hen has nested successfully. When a hen is nesting, light measurements drop because the sensor is hidden beneath her body. Successful females remain on their nests about 28 days, so biologists look for a four-week span of lower light levels. The females must be recaptured each year to retrieve the data.

It's no small feat to catch a harlequin duck. Not only are they small, they're shy and elusive. They also breed in remote high-mountain streams. Capture has grown easier in recent years thanks to the PTTs, which allow scientists to pinpoint a drake's location to within 150 meters. When biologists find males during the breeding season, the banded hens are there, too.

> "You need to be a serious 'harlequin duck whisperer' to move them at just the right pace."

Harlequin ducks mate for life. For the past three years, most of Hammond's research males have returned with their mates to Montana. In May 2018, after the first GPS blip appeared, Hammond rallied as many biologists, wardens, and volunteers as possible to recapture ducks on streams around Noxon Reservoir, an impoundment of the Clark Fork River near the Idaho border, where the signal originated.

A few days later, Hammond had a 10-person team stalking the upper stretches of Elk Creek, located south of the reservoir. For the first several hours at the site, no one could locate a harlequin. By 5 p.m., Hammond and several other team members gathered to discuss options, including erecting a fine-mesh "mist" net at the mouth of the stream to catch any ducks that flew down to spend the night on the reservoir.

Then Hammond's handheld radio beeped. Another team member had spotted a harlequin, one of the banded females, upstream.

Team members quickly but quietly converged on the site. As some watched the hen, others circled below to set a net across the stream. Reports of the duck's location flew back and forth on the radios. At one point the hen flew off, but then she returned to the stream—with a male.

With the net in place, team members began to usher the pair downstream. Herding harlequins requires a light touch. Pushing too hard causes them to flush prematurely and fly over the net. Waiting too long allows the birds to spot the net and dive under it. "There's definitely a learning curve to doing this," says Hammond. "You need to be a serious 'harlequin duck whisperer' to move them at just the right pace."

**CAPTURE SITE** Above: At Elk Creek near Noxon Reservoir, biologists spread a mist net across the stream to capture flying harlequins (far right). Right: FWP wildlife biologist Bruce Sterling hands a captured duck to John Ashley, a retired Glacier National Park biologist who pioneered harlequin research in the park.

CLOCKWISE FROM TOP LEFT: JEREMY ROBERTS; DONALD M. JONES; LAURA LINDQUIST

**IN GOOD HANDS** Top: University of Montana graduate student Warren Hansen uses a radio receiver to track harlequin ducks fitted with "backpack" VHF transmitters. Above: FWP wildlife biologist Kristina Smucker (right) and former FWP wildlife technician Kaitlyn Farrar release a drake harlequin in Glacier National Park. Right: Chris Hammond holds a healthy drake harlequin duck. "We get asked a lot by members of the public about the welfare of these research harlequins," he says. "As is the case with all the wildlife that FWP biologists and technicians handle, our protocols are reviewed by the International Animal Care and Use Committee, made up of veterinarians and wildlife officials."

The team timed this capture perfectly, and soon two ducks were caught in the net. Hammond and FWP wildlife biologist Kristina Smucker quickly moved in to gently slip the birds free from the mesh and into soft bags. The birds were weighed and examined, and then Hammond removed the female's precious geolocator before releasing the pair to, he hoped, produce another generation of harlequins.

Not every day is so successful. Of the ten pairs tagged in 2018 in northwestern Montana, along the Rocky Mountain Front, and on the Boulder River south of Big Timber, teams recovered only five males and four hens in 2019.

## MULTIPLE RUNOFF PEAKS

After graphing the geolocator data taken from the four hens this past spring, Hammond saw that three had failed to hatch chicks the previous summer. The fourth hen nested for the required 28 days.

Other areas also are reporting poor reproductive success. "Last year, Lisa Bate saw 20 single hens at McDonald Creek [in Glacier National Park], and only one had a brood. That indicates a lot of nest failures," Hammond says.

What accounts for the lack of success? No one knows for sure, but Bate and Hammond suspect that major changes in spring runoff caused by climate change could be the reason.

Because female harlequins usually choose nest sites just a few feet from a stream, they must wait to nest until after peak runoff, when floodwaters recede. Historically, streams experienced a single runoff peak. But in recent years, multiple peaks have occurred from sudden spring warm-ups or rain falling on snow-covered ground. A harlequin hen nesting after the first peak could lose her eggs in the second, when rising waters wash the nest away. "And harlequins don't re-nest after a failure like many other duck species do," Hammond says. "Once she starts incubating the eggs, the male heads back to the Pacific and isn't around for re-breeding."

Over the next several years, Hammond will verify whether runoff changes are a factor by comparing the location and timing of hen nesting with river stream gauge measurements. "Harlequins have evolved to sense a stream's peak flow and then nest right at that time," Hammond says. "But multiple peak flows caused by climate change are completely messing up that adaptation."

*For more information on Montana's harlequin ducks, visit the* Montana Outdoors *website at fwp.mt.gov/mtoutdoors and search for "harlequin."*

CLOCKWISE FROM TOP LEFT: JEREMY ROBERTS; DONALD M. JONES; DICK WALKER

## JANUARY–FEBRUARY 2019

**38th Annual Photo Issue**

## MARCH–APRIL 2019

**An Act of Finding Common Ground** Showing bipartisan cooperation, Congress advances landmark legislation that could rescue vulnerable wildlife species. By Tom Dickson

**Sniffing Around** FWP investigates the benefits of using K9 companions to assist with game law enforcement. By Michael Wright. Photos by Erik Petersen

**Behind the Curtain** Montana's state parks system is struggling, even as employees do all they can to keep sites clean, accessible, and enjoyable. By Tom Dickson

**Far More Than Fishing** Considering the wide variety of water- and land-based outdoor recreation and wildlife habitats these riparian areas provide, Montana's "fishing access" sites may be due for a new name. By Peggy O'Neill

**Montana's Conservation Heroes** Representing a mix of occupations and approaches, the newest inductees into the Montana Outdoor Hall of Fame embody a common vision of protecting the lands, waters, and wildlife that make Montana the last best place. By Tom Palmer

**The Amazing Spider Silk** From catching insects to inspiring revolutionary medical devices, this remarkable material is worthy of a superhero. By Ellen Horowitz

## MAY–JUNE 2019

**They Swam Beneath Dinosaurs** For 70 million years, paddlefish have lived in what is today Montana. Here's how FWP is helping this amazing fish species thrive in the most challenging era of its existence. By Allen Morris Jones

**Pretty Little Predators** Dragonflies are lovely to look at. Unless you're a mosquito or other prey. By Dave Shepard

**Rebirth of the Upper Clark Fork** No one can make a new river... Except maybe they can. By Tom Reed

**Straight from the Source** Five expert Montana fly-fishing guides identify the most common errors they see—and how to correct them. By Patrick Straub

**Working the Walleye Factory** Fresno produces more of these delicious fish per acre than any other reservoir in Montana. Here's how to put some in your cooler. By Tom Dickson

## JULY–AUGUST 2019

**Ain't She a Butte?** By Eric Heidle

**A Little Goes a Long Way** FWP, landowners, and private conservation groups are working to keep just a bit more water in spawning tributaries—the natural "hatcheries" of Montana's storied trout rivers. By Tom Dickson

**Deceptively Dangerous** Low-head dams don't seem hazardous—until you're trapped underwater beneath one. By Nick Gevock

**What We're After** Finding fish and solace at FWP's family ponds. By Ben Long

**Wet and Wild** See record-book bighorn rams? Nap on a beach? Leap into crystal-clear water? Whatever your fancy, a visit to Flathead Lake State Park should be on everyone's list of must-do summer adventures. By Peggy O'Neill

**Exceeding Expectations** While not offering much for Montana's dispirited CRP fans, the 2018 Farm Bill's other land and water conservation programs will provide tens of millions of dollars to help farmers, ranchers, wildlife, and public recreational access in the state's prairie region. By Catherine Wightman

## SEPTEMBER–OCTOBER 2019

**Solving Montana's Moose Mysteries** FWP researchers search for answers to help conserve these popular big game animals in the face of rising temperatures, shrinking habitat, and more predators. By Tom Dickson

**Quick Release** The odds of your dog ever becoming caught in a trap or snare are slim. Even so, you might want to know where the devices are typically placed, how they work, and, in the unlikely event your dog gets caught, how to set it free. By Tom Dickson

**Where the West Comes Alive** A national historic landmark and one of Montana's premier tourist attractions, Bannack State Park preserves the essence of a frontier gold mining town with all its glory, hardship, and heartbreak. By Peggy O'Neill. Photos by John Warner

**Postcard from CWD Country** One deer hunter's message to the rest of Montana—and visiting hunters—on ways to think about hunting, field dressing, and consuming venison in (and from) areas where this troubling disease has finally appeared. By Andrew McKean

**Using "Zone Defense" to Contain CWD** Montana's approach to slowing the spread of the deadly deer disease combines surveillance, testing, transportation restrictions, and increased harvest in key areas. By Andrew McKean

## NOVEMBER–DECEMBER 2019

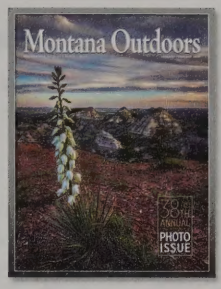
**The Wankel T-Rex Makes "The Show"** How Montana's most famous prehistoric predator ended up starring in a premier Smithsonian Institution exhibit. By Steve Hendrix

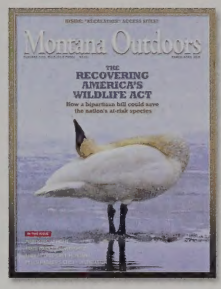
**Searching for Something They Don't Want to Find** FWP and partner groups search Montana caves for signs of a disease that has killed millions of bats across the United States. By Karl Puckett. Photos by Rion-Norris Sanders

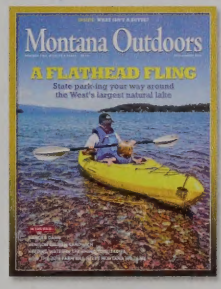
**The Greatest Divide** How the Contiental Divide shapes Montana's weather, landscape, economy, and culture. By Eric Heidle

**Frigid Feathers** The ingenious ways birds stay warm through Montana's long, cold winters. By Ellen Horowitz

**Grim Future for a Festive Bird?** FWP biologists and others track harlequin ducks to learn why populations appear to be declining. By Laura Lundquist





**BACK ISSUES**

**ONLINE:** All stories from 2002–2019 issues are available online at **fwp.mt.gov/mtoutdoors/**.
Most back issues of *Montana Outdoors* before 2002, along with issues of most predecessor publications (*Montana Wild Life*, *Sporting Montana*, and *Montana Wildlife*) dating to 1928, are available online at **https://archive.org/**.

**PAST MAGAZINE ISSUES** are $4.50 per copy, which includes shipping. Send your request and payment to: *Montana Outdoors*, P. O. Box 200701, Helena, MT 59620-0701. Or you can e-mail us at **Angie.Howell@mt.gov**.

# Members only

BY TOM DICKSON

One of my most exciting deer hunts took place while I was sleeping.

It was during a warm, early November afternoon near Cascade. I'd settled in behind a downed cottonwood with two deer antlers in the hopes of "rattling" in a deer. The idea is to bang the antlers together to mimic the sound of battling bucks to lure a real deer within bow or gun range.

I rattled on and off for about 15 minutes and then, as so often happens to me in the woods when the sun is shining and nothing's happening, I fell asleep. I'm not sure for how long—maybe half an hour—but when I woke and sat up, a massive 5x5 whitetail stood staring at me from about 60 yards away. As soon as he realized what I was, he spun around and was gone.

While kicking myself for the catnap, I still couldn't help but marvel at what had just happened. I'd tried rattling many times before. This was the first time it actually worked!

Bringing wildlife in close is a thrilling way to experience nature. After much practice, I've learned to call in wild turkeys, ducks, and Canada geese. Using the classic red birchwood-and-pewter Audubon bird call, I've also attracted juncoes, titmouses, and other songbirds.

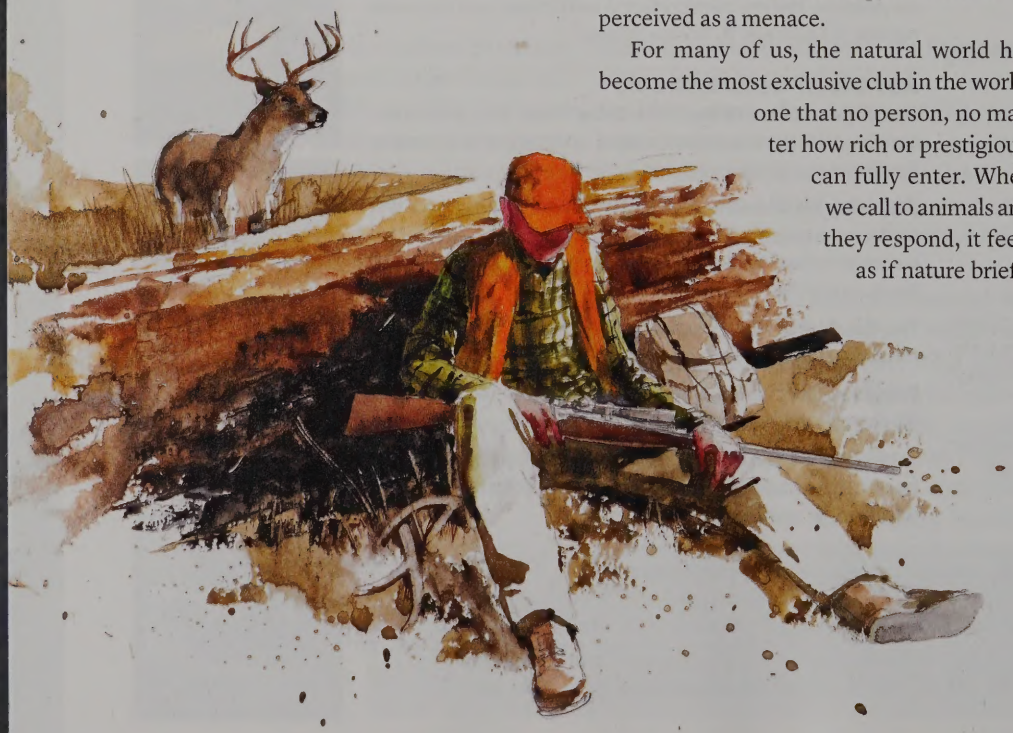
And of course, that's entirely the appeal of angling. I toss a fly or lure in the water hoping a fish views my offering as the real deal. Then the two of us connect, via the line.

Duping a critter doesn't happen with every attempt; usually animals ignore my entreaties. But when it does occur, the moment can be mesmerizing. It creates a sense of fully entering the natural world, even if just for a moment.

I suspect that these encounters tap into a primordial past. For hundreds of thousands of years, our ancestors more or less coexisted with other animals. We were just another creature roaming the plains, as close to nature as any bison or cheetah.

These days, nature wants nothing to do with us. As we stumble through the forest, animals flee at our approach while pine squirrel activate their alarm systems. We try moving slowly, stepping around twigs, wearing muted colors. It doesn't help; we know we're perceived as a menace.

For many of us, the natural world has become the most exclusive club in the world, one that no person, no matter how rich or prestigious, can fully enter. When we call to animals and they respond, it feels as if nature briefly opens that door and whispers, "Hey, you're part of us. Welcome back."



Bowhunters and nature photographers come closest to gaining membership. The best are stealthy, camoed head to foot, bodies and clothing disinfected with scent-erasing soap. Bowhunters often stalk their prey in slow motion, taking one careful step at a time until they experience what *Field & Stream* columnist Bill Heavey calls "the strange thrill of being undetected inside a wild animal's bubble of awareness."

It's one thing to sneak up on animals undetected. It's a wholly different thrill to break the silence with a turkey gobble or antler rattle to convince a wild animal to come *toward* you. My heart pounds whenever a distant duck turns to investigate my soft quacks. Or a tom turkey struts toward my lovelorn hen call, me shaking so much I can't hold the shotgun steady.

As for bugling in a 700-pound bull to within 30 yards? I'd probably pass out.

There are places where animals allow people to come close—often dangerously close. Some national parks, like Yellowstone, for instance. Because they aren't hunted, the animals there move about seemingly unbothered by crowds of visitors. I can understand the appeal, and have enjoyed watching wildlife there myself.

Yet there's something about Yellowstone that makes me uneasy. Some consider the park an Eden, a peaceable kingdom where animals and people coexist. But too often the animals' lack of fear leads to unnatural enounters with people. Except for the occasional feeder-habituated songbird or curious fox kit, wildlife should be skittish around humans and other predators. It's a trait they need to survive.

Groucho Marx once said, "I don't want to belong to any club that would have me as a member." I feel that way about zoolike settings where nature is a bit too comfortable with our presence. There's something deep within me that would love to be fully accepted into the natural world. But if I ever were allowed in for more than a few moments, I'd have to leave. My very presence would prove it wasn't the club I thought it was after all.

*Tom Dickson is editor of* Montana Outdoors.

ILLUSTRATION BY STAN FELLOWS

# Mottled sculpin

*Cottus bairdii* By Jim Pashby

Unless they work as a fisheries biologist, most people have never seen a mottled sculpin, one of Montana's most unusual native fish. Yet in every fly shop across the state there's a bin filled with artistic feather and deer-hair renderings of these small stream dwellers. Just ask for a Muddler Minnow.

ILLUSTRATION BY JOSEPH TOMELLERI

## IDENTIFICATION

The mottled sculpin is a three- to four-inch fish that looks like a cross between a toad and a baby sauger. Its flat, disproportionately large head has two big, bulging eyes and a wide, lipped mouth. The body tapers back to a rounded tail. The pectoral, dorsal, and anal fins are all oversized compared with those of most other fish species. Like all sculpins, mottleds are scaleless, with a slick skin. The body is mottled in a splotchy camouflaged pattern of brown and black.

"Sculpin" is Latin for "sea scorpion," which freshwater sculpins closely resemble.

## RANGE

Montana is home to three sculpin species—torrent, spoonhead, and mottled—all living in the riffles of cold, clear streams and rivers and sometimes along rocky lakeshores. The torrent is found only in the state's far northwestern corner, in the Kootenai River basin. The spoonhead is confined to the small Saskatchewan River basin in and near northeastern Glacier National Park. The mottled is the most widespread, living in rivers and streams from the Continental Divide as far east as Havre, Lewistown, and Big Timber.

Elsewhere, the mottled sculpin ranges throughout the Rockies and from Manitoba through most of eastern Canada and south to the Great Lakes states and Appalachia.

*Jim Pashby is a writer in Helena.*

## SCIENTIFIC NAME

***Cottus*** **comes from the Greek "kottos," meaning fish, and** ***bairdii*** **refers to S.F. Baird, head of the U.S. Fish Commission in the late 1800s.**

Colorful regional nicknames include spoonhead, miller's thumb, and cockatouch.

## FEEDING

Mottled sculpins feed on midge pupae, mayfly and caddis fly larvae, aquatic worms, and small crayfish. They use their massive pectoral fins to hold themselves steady in fast current, wedging their head between stones in search of prey.

## REPRODUCTION

In spring, the male mottled sculpin finds a cavity below a flat rock and waits for a mate. He chases rivals away, rapidly opening and closing his mouth like a barking dog. When a female approaches, the male shakes his bulky head and bites her head and fins as a sort of welcome. She enters the cavity and turns upside down. He does the same, and, as they press up against the underside of the rock ceiling, the two vibrate to release milt and eggs, which stick to the hard surface.

## THE FLY

The Muddler Minnow, invented in 1937 by Minnesota native Don Gapen, is one of the most popular trout flies in North America. Gapen tied it to imitate sculpins he found in the bellies of the monster brook trout he caught in Ontario's Nipigon River, where he worked as a fishing guide. He is credited with being the first fly tier to spin deer hair to create a dense, bulky head. Matched turkey wing quills and gray squirrel tail hair are tied behind the head, and gold sparkle braid wraps around the heavy streamer hook shank.

The Muddler Minnow is mainly fished like a streamer in riffles, using a sink-tip fly line or a few small split shot pinched to a heavy tippet to keep it low to the bottom. The fly is especially effective at night, and at any hour in the fall, when brown trout feed aggressively before spawning.

The Muddler Minnow was first popularized in Montana during the early 1950s by Dan Bailey of Livingston, who pitched it to clients for catching trophy browns on the Yellowstone River.

Later variations by inventive fly tiers include the Marabou Muddler, Tunghead Muddler, Zuddler, Kinky Muddler, and Conehead Bunny Muddler.

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## Antlers poking up out of a pickup bed always spike my curiosity

As FWP game wardens, one of our jobs is to make sure hunters have their licenses and tags in order. We also investigate fish and wildlife crimes, gather evidence, and help keep people who are enjoying Montana's outdoors safe and legal. No matter what we do, we're protecting the integrity of both the outdoors and outdoor experiences. My name is Shane Reno. And the outside is in me.

SHANE RENO ★ WARDEN SERGEANT ★ HAVRE

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